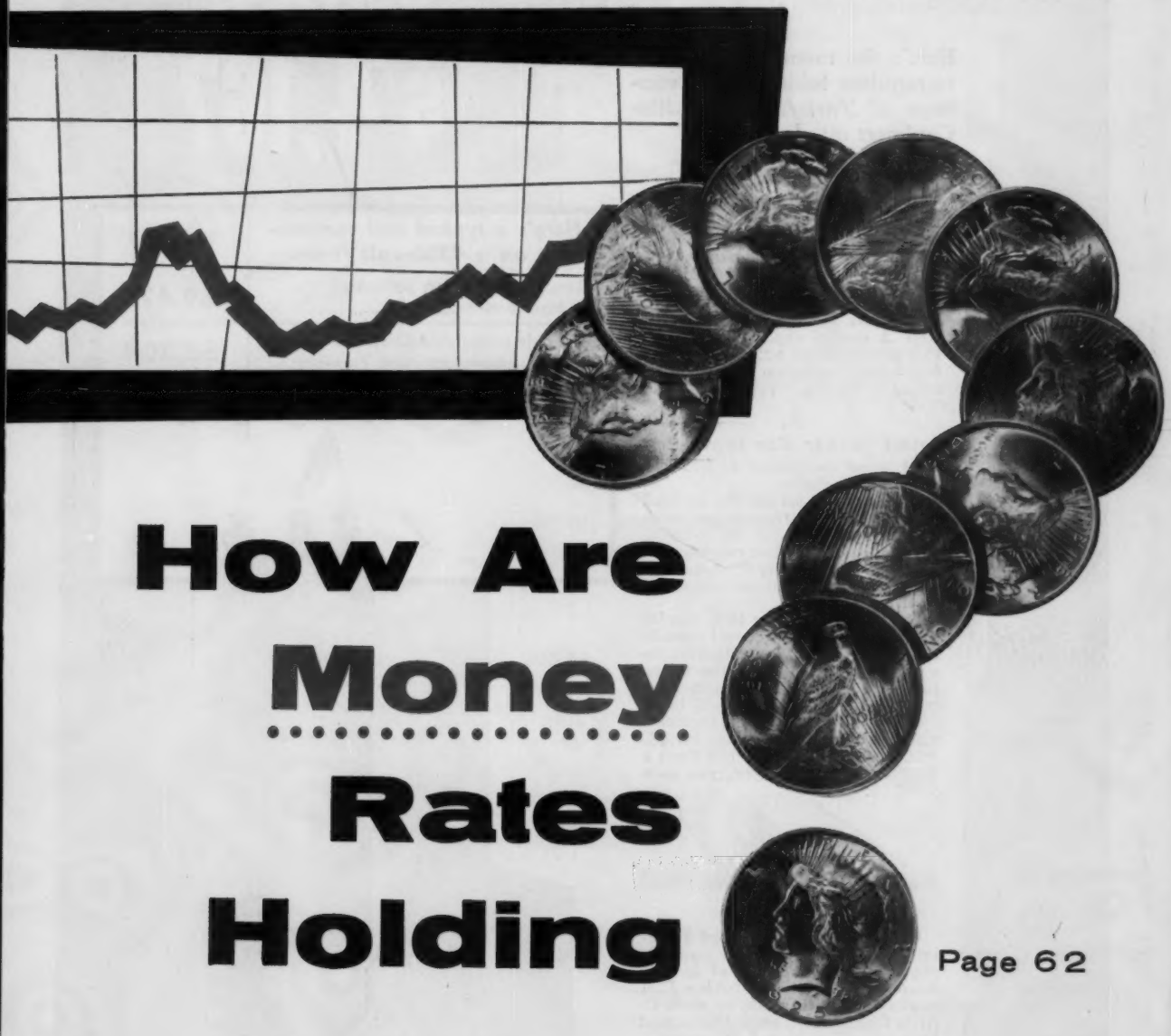
The Electrical Industry's Weekly Magazine

April 15, 1957

Electrical World

Price 50 Cents

A McGraw-Hill Publication



How Are Money Rates Holding

Page 62

Engineers Propose New Water Resources Policy . . . Page 69

E R POWER
UNIVERSITY MICROFILMS I
313 N 1 ST
ANN ARBOR MICH
QS W 1

Compare cost of Regulators and LTC Transformers

Regulators save $4,167

Here's the money-saving way to regulate taking full advantage of *Vari-Amp* on Allis-Chalmers regulators.

1.

Select substation size: In example shown, we used: 3750 kva, 13.2 kv, 164 amps, self-cooled.

2.

Determine percent regulation required. Here's the important step. A careful check will disclose that few systems actually require full ±10% regulation today. In this example +8¾% −7½% is needed.

3.

Select proper size regulating unit based on current or kva and range of regulation.

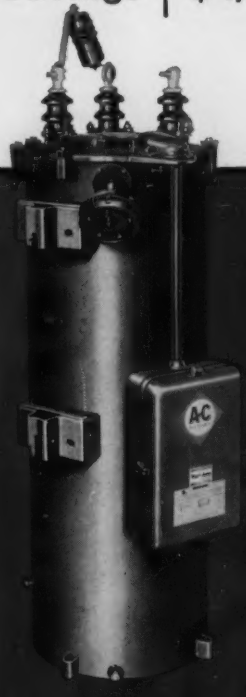
To do this job, set up the no load taps on the transformer (or order an alternate voltage) for a 2½% voltage raise. It is then necessary to get only +6¼% raise from the regulator to obtain the desired 8¾% total raise.

On the buck side, −10% regulation from the regulator will provide the needed −7½% regulation for the system. The +2½% in the transformer algebraically added to −10% provides the −7½% buck.

Since an Allis-Chalmers regulator with *Vari-Amp* providing +6½% −10% regulation costs less than a ±10% unit of any type, you save $4167.00.

Here's a typical cost comparison on a 4330-volt feeder:	
Load tap changing portion of transformer	$9,471
3 single-phase Allis-Chalmers distribution regulators using *Vari-Amp*....	$5,304
Savings	**$4,167**

Get the Key to Low Cost Regulation (No. A-5307) with complete charts and explanation of how to figure savings with *Vari-Amp*. Call your nearby A-C office, or write to Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.



A-C ALLIS-CHALMERS

A-5332

Electrical World

Vol. 147, No. 15 APRIL 15, 1957

Published for 83 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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Tornadoes, Blizzards Hit Southwest

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Don't Make the Customer Wait

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DISTRIBUTION

Gives System Planning Criteria

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Fly Ash Prevents Pipe Corrosion

Black iron pipe surrounded by 6 in. of fly ash hasn't corroded after burial in sand for 21 months.....p 84

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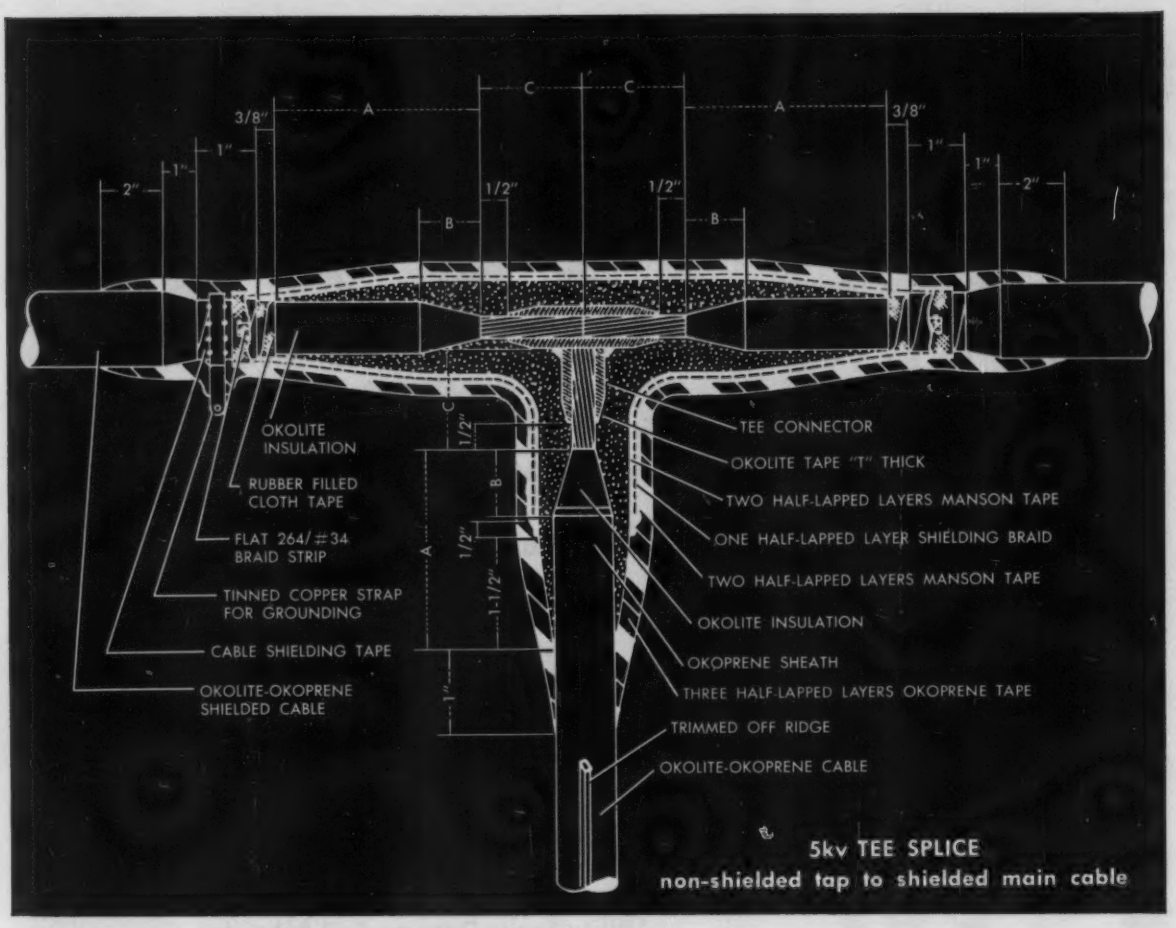

The "simple" tee splice . . .

The simple tee splice . . . is really not so simple. A glance at the splice diagram above certainly shows this. Don't gamble with the dependability of your cable system by neglecting its splicing or terminating. Use the correct splicing methods and the best materials available to insure the safety of the system.

Complete splicing and terminating diagrams, like the one above, along with step-by-step instructions covering rubber-insulated cables up to 5000 volts are available in Okonite Bulletin EW-1085. These splicing instructions are a result of Okonite insulation research—the same research that has developed the industry's best-known splicing materials . . . Manson friction tape, Okonite rubber tape, Okolite high voltage rubber tape, and Okoprene weather-resistant neoprene tape. For full details, contact your distributor or The Okonite Company, Passaic, N. J.

Available through authorized distributors only

OKONITE **splicing tapes**

4326.

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. . . from the publisher

"One of the toughest jobs I face is selling other people in my outfit on what we do."

This was the comment not long ago of the sales vice president of a large eastern power company. And it probably reflects fairly accurately the position to which the sales function has been relegated in many a utility. In fact, some have said that electricity is so good that if need be, it could sell itself.

But today the sales force has a real fight on its hands. It must even outdo the golden days it once knew when utility men peddled refrigerators door to door and you could buy a "copper washer for a silver dollar."

That's why you'll find "Selling" on page 96. It's our big new weekly section devoted exclusively to new load building techniques.

Last year we published 250 pages of sales articles. This year we're going still further. Besides the weekly "Selling" section our two sales editors plan at least three special reports plus a myriad of shorter features.

If selling is your business, then the "Selling" pages are for you. And who knows? Placed as they are among our other stories, a bit could rub off on some of your own colleagues who still may think electricity sells itself.

Fischer Black

ELECTRICAL WORLD

Published weekly by McGraw-Hill Publishing Co., Inc. James H. McGraw (1860-1948), Founder. **Executive, Editorial, Circulation, and Advertising Offices:** McGraw-Hill Building, 330 West 42nd Street, New York 36, N. Y. Printed at 99-129 North Broadway, Albany 1, N. Y. See panel at right for directions regarding subscription or change of address.

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United States and Canada subscription rate for individuals in the field of the publication $6.00 per year, single copies 50 cents. Other Western Hemisphere and the Philippines $20.00 payable in advance and other countries $30.00 payable in advance.

Second-class mail privileges authorized at Albany, N. Y. Printed in U.S.A.

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NOW!...*Finally!*...Here's a method all wrapped up in

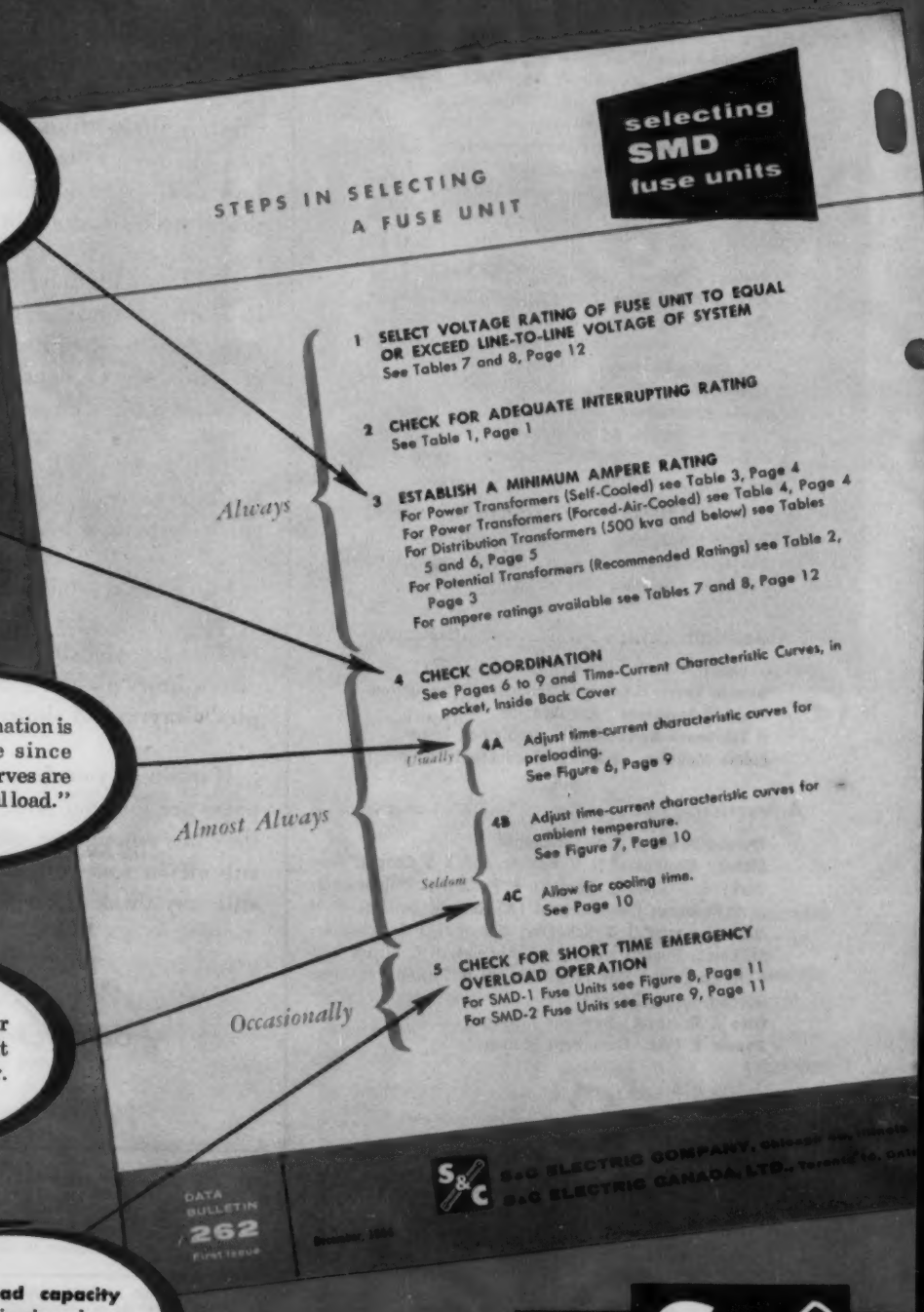
New ampere rating recommendations give maximum protection for transformers with precise allowances for short-time daily overloads.

Two methods of coordination are offered: Rule-of-thumb and Precision.

Preloading information is made available since Time-Current Curves are based on "no initial load."

How to compensate for successive short-circuit operations of the breaker.

Fuse overload capacity information is given here for the first time anywhere.

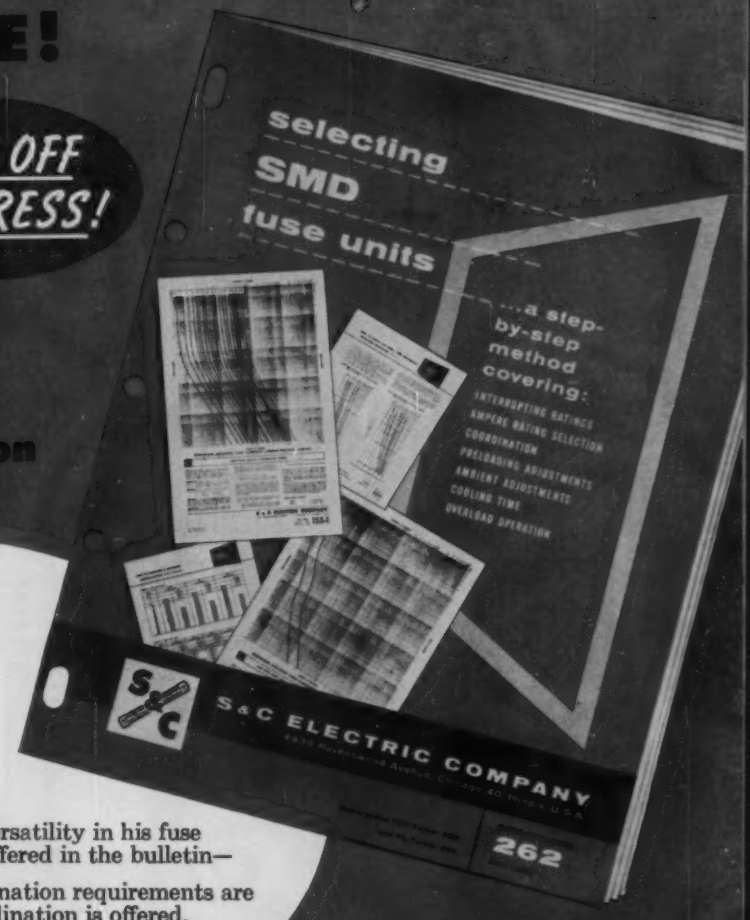

selecting SMD fuse units
STEPS IN SELECTING A FUSE UNIT
1 SELECT VOLTAGE RATING OF FUSE UNIT TO EQUAL OR EXCEED LINE-TO-LINE VOLTAGE OF SYSTEM
See Tables 7 and 8, Page 12
2 CHECK FOR ADEQUATE INTERRUPTING RATING
See Table 1, Page 1
Always
3 ESTABLISH A MINIMUM AMPERE RATING
For Power Transformers (Self-Cooled) see Table 3, Page 4
For Power Transformers (Forced-Air-Cooled) see Table 4, Page 4
For Distribution Transformers (500 kva and below) see Tables 5 and 6, Page 5
For Potential Transformers (Recommended Ratings) see Table 2, Page 3
For ampere ratings available see Tables 7 and 8, Page 12
4 CHECK COORDINATION
See Pages 6 to 9 and Time-Current Characteristic Curves, in pocket, Inside Back Cover
Almost Always
Usually
4A Adjust time-current characteristic curves for preloading.
See Figure 6, Page 9
Seldom
4B Adjust time-current characteristic curves for ambient temperature.
See Figure 7, Page 10
4C Allow for cooling time.
See Page 10
Occasionally
5 CHECK FOR SHORT TIME EMERGENCY OVERLOAD OPERATION
For SMD-1 Fuse Units see Figure 8, Page 11
For SMD-2 Fuse Units see Figure 9, Page 11
DATA BULLETIN 262 First Issue
S&C ELECTRIC COMPANY
S&C ELECTRIC CANADA, LTD.

S&C

for power fuse coordination ONE PACKAGE!

JUST OFF THE PRESS!

it frees you from hocus-pocus; it gives you more fuse protection



The key to this method is a step-by-step sequence as shown at the left (the first inside page of the new Data Bulletin 262).

For each step, all the necessary data is at your finger tips. You have a choice of two methods—

for the man who wants more range and versatility in his fuse coordination, a "precision" technique is offered in the bulletin—

for the man-on-the-go, whose fuse coordination requirements are not so rigorous, the "rule-of-thumb" coordination is offered.

Write today for your copy of this 12-page-plus-cover Data Bulletin 262, with necessary TCC curves.

S & C Power Fuse Type SMD, illustrated below: vertical style 69 kv.

Specialists in High-Voltage Circuit Interruption Since 1910

S&C ELECTRIC COMPANY

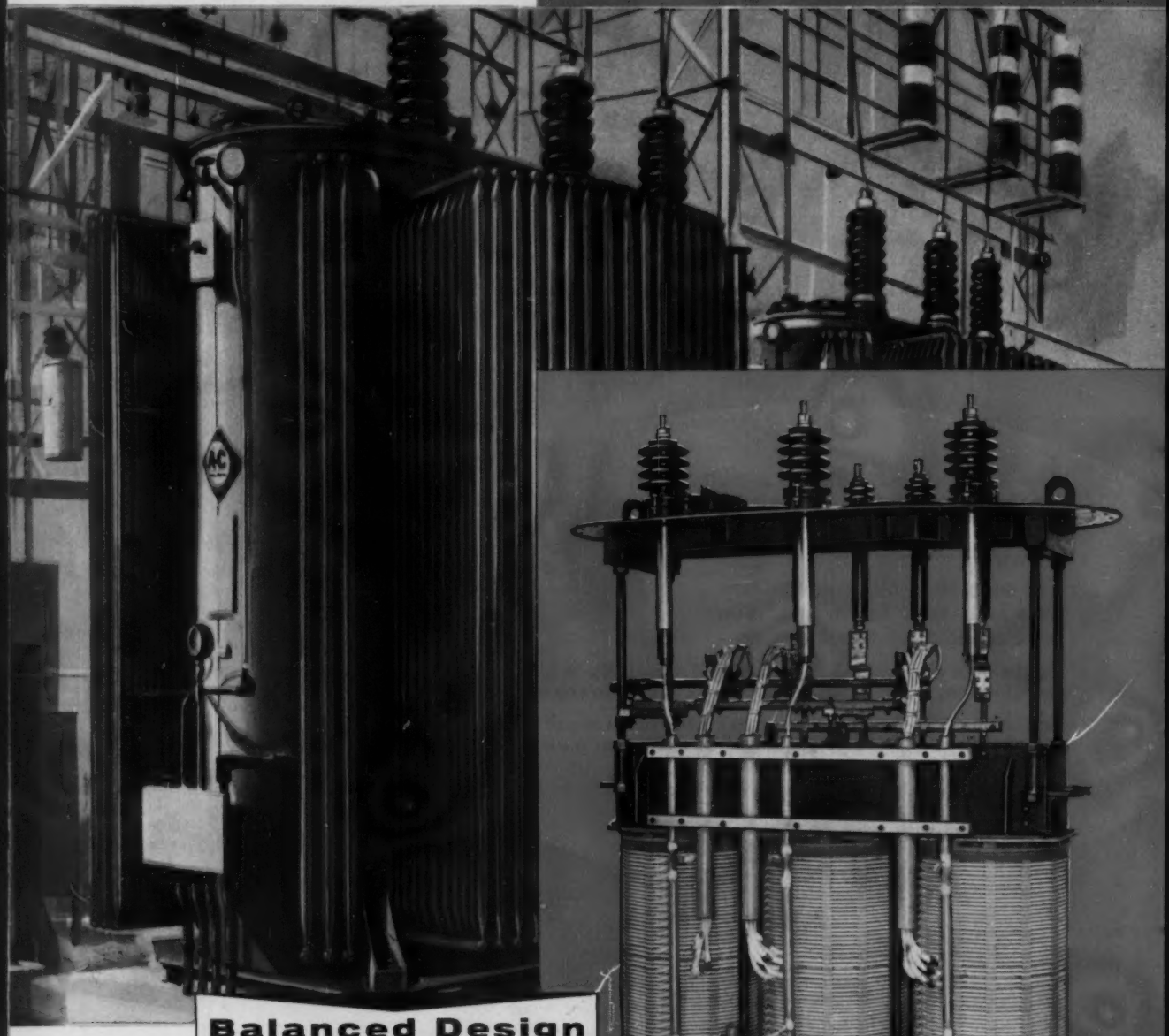
4401 RAVENSWOOD AVENUE • CHICAGO 40, ILLINOIS • U.S.A.

In Canada: S & C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario

POWER FUSES • DISTRIBUTION CUTOUTS AND FUSE LINKS • LOAD INTERRUPTERS • METALCLAD SWITCHGEAR

ALLIS-CHALMERS
POWER TRANSFORMERS

Engineered



Balanced Design

...means MORE for your Transformer Dollar

With electrical equipment replacement costs increasing, it's more important than ever to insist upon maximum transformer value. In Balanced Design, features such as corona-free insulation, low gradients, and uniform cooling complement each other to provide outstanding dependability and long transformer life. Get all the facts. Call your nearby Allis-Chalmers office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-

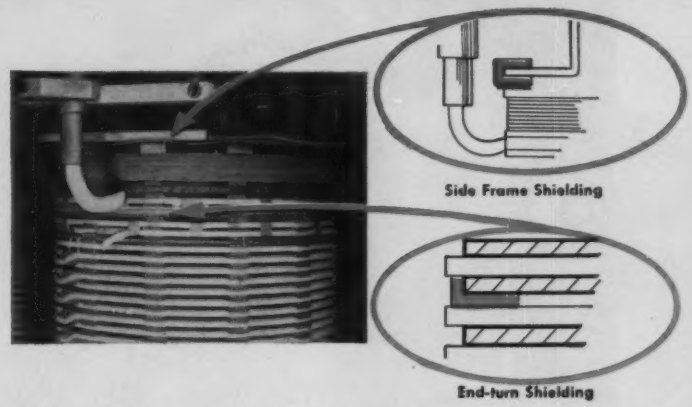
to stay young

Here's Why

1

Corona-Free Design
gives insulation long life

Creeping paralysis caused by corona can't take the life of this transformer. Advanced insulation practices, dimensional properties, proper coordination between solid and liquid insulation materials prevent concentration of dielectric fields and keep corona from forming.

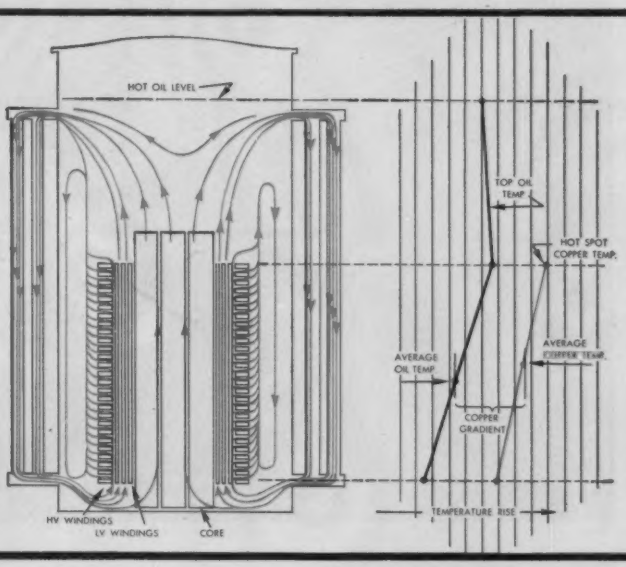


Shown are just two of many shielded areas that protect windings from the overstresses of lightning and switching surges.

2

Low Gradients
thorough cooling lengthens service

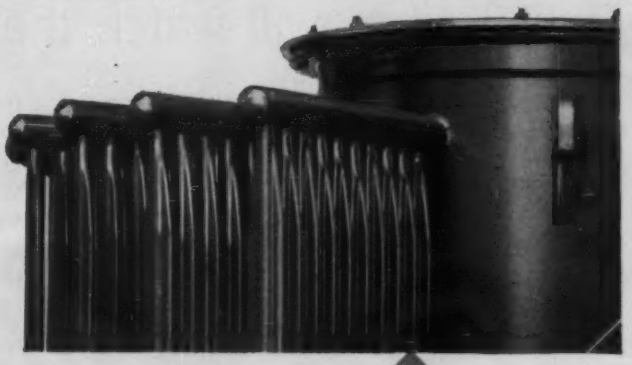
Temperature gradients are lower—hot spots are minimized in Allis-Chalmers transformers. Assembly is built for rapid cooling. Coils permit cooling oil to flow through and around all layers. Special core spacers on larger units allow oil to flow through core structure. Insulation coordination and uniform cooling increase insulation life and multiply the value received for each transformer dollar spent.



3

New Radiator Design
cuts maintenance

Fewer parts—simplified shape facilitates inspection . . . there are no nooks and corners where dirt and corrosion get in their destructive licks. Painting costs are reduced. More uniform cooling (with less floor space requirements) extends transformer life.



CHALMERS

A-C ALLIS-CHALMERS

A-5398

Next—pilots will watch their own landings on TV!

Up from pitch-dark airfields come light signals invisible to the human eye . . . A new electronic "cat eye" in the cockpit amplifies these signals to produce daylight pictures of the ground on the pilot's television screen.

Thus, in blackout or encased in radiation-proof cockpits, tomorrow's pilots will guide their planes in to safe landings by this latest triumph of electronics.

Like the electronic age itself, the fabulous "cat eye" depends for its operation on the very best of electrical insulations—the kind CDF has been manufacturing for over sixty years.

FOR SPECIFIC INFORMATION on CDF products, see Sweet's, Electronics Buyers' Guide, and other directories. Then send us your print or your problem, and we'll return free samples and technical literature.

CDF MAKES Dilecto Laminated Plastics • Celoron Molded Plastics • Micabond Mica Products • Diamond Vulcanized Fibre • Flexible Tapes of Teflon*, Silicone, and Micabond • Resin-Impregnated Spiral Tubing • *Complete Fabrication Facilities.*

*duPont trademark for its tetrafluoroethylene resin

CONTINENTAL-DIAMOND FIBRE

A SUBSIDIARY OF THE BUDD COMPANY • NEWARK 15, DELAWARE

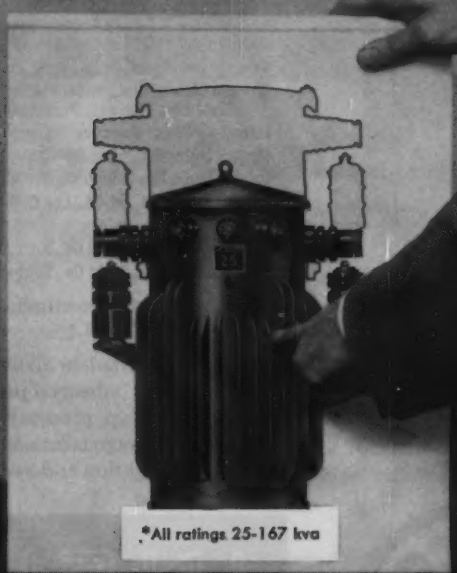
Your Westinghouse representative can prove...

NEW CHANGEOUT SAVINGS

Because all new Westinghouse transformers* are up to 13" shorter, 33% lighter, you can now make changeouts to next higher kva ratings without replacing poles or relocating secondaries

Among major utilities enjoying the advantages of Westinghouse "new-size" full-capacity transformers is Alabama Power Company, whose D. D. Wendel, manager of transmission and distribution, is seen here with John Main, Westinghouse Birmingham representative.

J-70767



*All ratings 25-167 kva

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Westinghouse

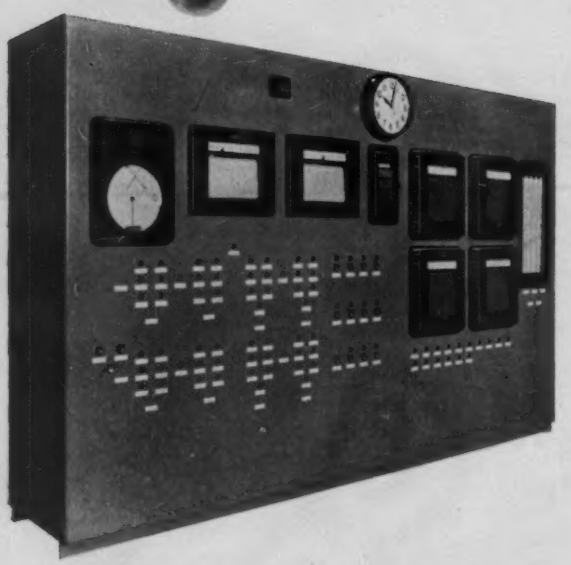
INFILCO DEMINERALIZATION EQUIPMENT...

ENGINEERED to meet YOUR requirements for HIGH PRESSURE BOILER FEED

- **Maximum reliability**
- **Highest quality water**

Check some of these installations. They are representative of INFILCO's advanced engineering and development in providing water suitable for today's (and tomorrow's!) high pressure steam generators in the utility field.

Alabama Power Company, Gorgas Station ... Gorgas, Ala.
California Electric Company, Highgrove Plant ... Highgrove, Calif.
Commonwealth Edison Company, Crawford Station ... Chicago, Ill.
Commonwealth Edison Company, Will County Station ... Joliet, Ill.
Commonwealth Edison Company, Station No. 6 ... Waukegan, Ill.
Chicago District Electric Generating Corp., State Line Station ... Hammond, Ind.
Interstate Power Company, Dubuque Station ... Dubuque, Iowa
Municipal Gas & Electric Department, Holyoke Plant ... Holyoke, Mass.
Omaha Public Power District, North Omaha Station ... Omaha, Neb.
Central Power & Light Co., Lon C. Hill Station ... Corpus Christi, Texas
Central Power & Light Co., Victoria Station ... Victoria, Texas
Wisconsin Power & Light Co., Rock River Station ... N. Beloit, Wis.
Wisconsin Power & Light Co., Edgewater Plant ... Sheboygan, Wis.



Control Panel, Commonwealth Edison Company, Will County Station, Joliet, Ill.

It will pay you to investigate. Write today for Bulletin 1960-C.-EW-11.

Inquiries are invited on all water and waste treatment problems for all industrial purposes, including boiler feed water makeup, process water clarification and purification, sewage treatment, waste pollution control, material reclamation and related needs.

INFILCO

5740-11

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Field offices throughout the United States and in foreign countries

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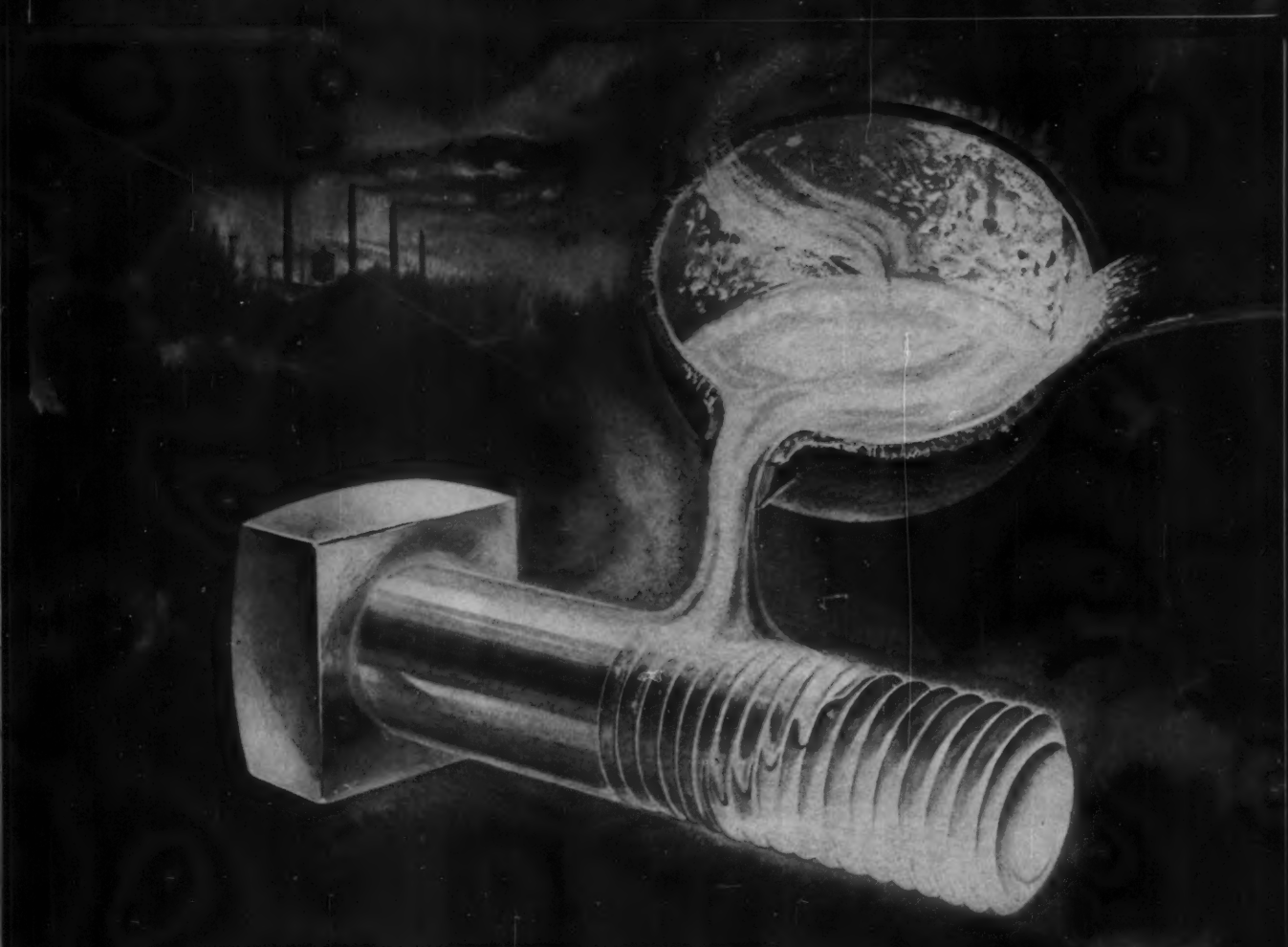


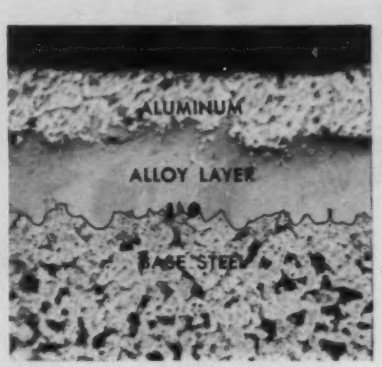
The illustration is symbolic — in practice, Bethlehem fasteners are dipped in molten aluminum, then centrifuged, producing a coating that is uniformly smooth over the entire surface.

Bethalume Coating for Fasteners is Superior in Corrosive Atmospheres

Looking for longer service life from steel fasteners exposed to corrosive conditions? Use fasteners which are protected by Bethlehem's Bethalume coating — the hot-dip aluminum coating which, in equal thicknesses, outlasts zinc in most corrosive atmospheres.

With Bethlehem's new coating facilities, fasteners of virtually all types and sizes can be coated with a smooth layer of corrosion-resistant aluminum. Excess coating is removed quickly while in the molten state, leaving the coated threads clean and sharp.

If you would like to know more about the Bethalume coating for fasteners, and the long service life it makes possible in atmospheric and heat corrosion, just get in touch with the nearest Bethlehem office.



Section through Bethalume coating, showing aluminum overlay and iron-aluminum alloy layer.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

If Paul Revere galloped through Lexington

His way would be lighted with POWER

from **Pole Star**

DISTRIBUTION TRANSFORMERS

Pole Stars are available in all single phase sizes from 3 through 500 kva, through 67,000 volts. Protected Pole Star Transformers are available through 100 kva.

Aroused and warned by the most famous nocturnal equestrian of all time, the Minute Men began forming to meet the oncoming British Redcoats during the early hours of the morning of April 19, 1775. The historic skirmish that took place a few hours later might be considered minor by present-day numerical standards (only eight were killed in the initial clash at Lexington, Mass.), but of course *many* things have changed in 180 years.

POLE STAR pt

PENNSYLVANIA

For example, if Paul Revere were to gallop through Lexington tonight, his way would be lighted with power from Pole Star Distribution Transformers. In fact, the pictured installation — on Massachusetts Avenue, across from Minute Man Lane, Lexington — is typical of many throughout the Boston-Lexington-Concord section, so that a large percentage of the territory covered on that famous midnight ride of yesteryear now is illuminated with power from Pole Star Transformers.

Pole Stars are serving as vital links in distribution systems throughout the *entire* United States — having gained nation-wide recognition in a period of just ten years. That's a short time from the historian's point of view, but it's long enough to prove conclusively that the Pole Star patented lap-on-top core *does* make a difference. Write for more details.

TRANSFORMER COMPANY **CANONSBURG, PA.**

A Mc Graw Electric Company Division *Greater Pittsburgh District*

If Paul Revere galloped through Lexington

His way would be lighted with POWER

from **Pole Star**

DISTRIBUTION TRANSFORMERS

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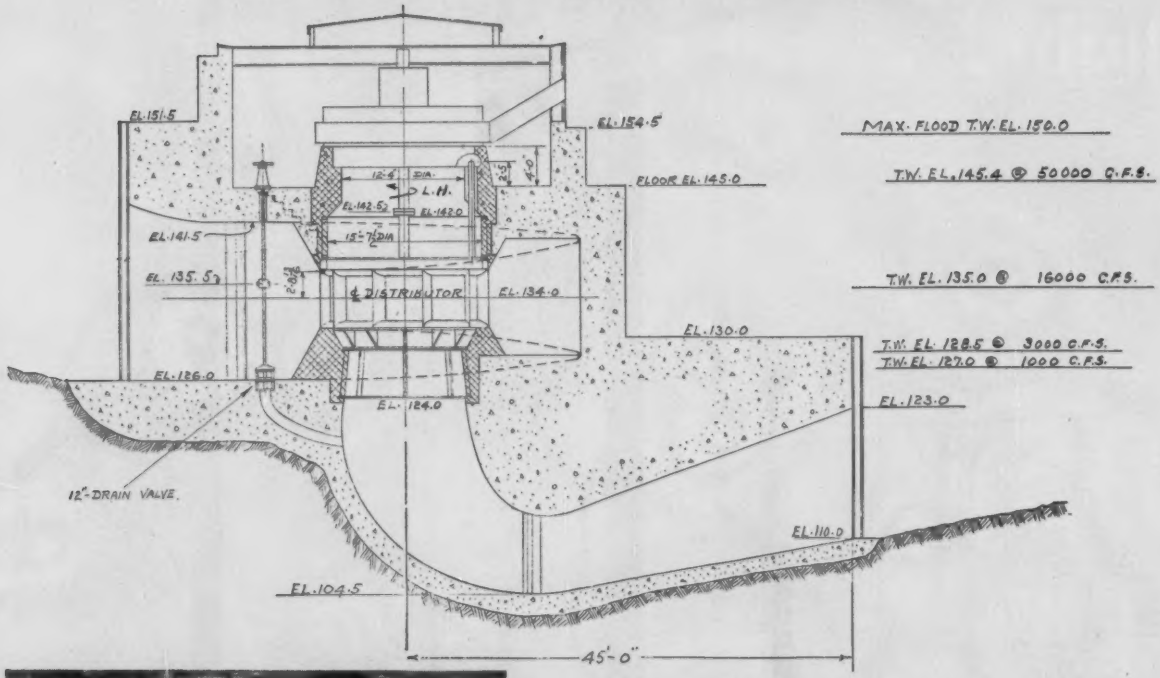
TRANSFORMER COMPANY CANONSBURG, PA.

A Mc Graw Electric Company Division *Greater Pittsburgh District*

at the Central Maine Power Company's Bar Mills Station

Two Leffel Turbines Help Boost Power Output By 150%



An increase in annual output from 8,500,000 KW hours to 21,000,000 KW hours is expected by the Central Maine Power Company as a result of the recently completed rebuilding of their Bar Mills Hydroelectric Station. Two Leffel turbines—replacing four smaller turbines installed in 1919—play a major role in the Bar Mills redevelopment.

Each of the turbines is rated to develop 3,000 HP at 120 RPM under a twenty foot net effective head. The turbines, of the fixed-blade propeller type, are installed in concrete spiral casings and mounted on curved concrete elbow draft tubes.

The top view at the left shows the completed power plant and dam; the bottom view shows the installation of the turbine stay ring and pit liner in the concrete spiral casing.

Here and throughout the world, Leffel turbines are economically and efficiently harnessing water power. Before you plan any future turbine installation, get the facts on efficient, reliable Leffel turbines tailored to meet all your hydroelectric power requirements. Write today for complete information.

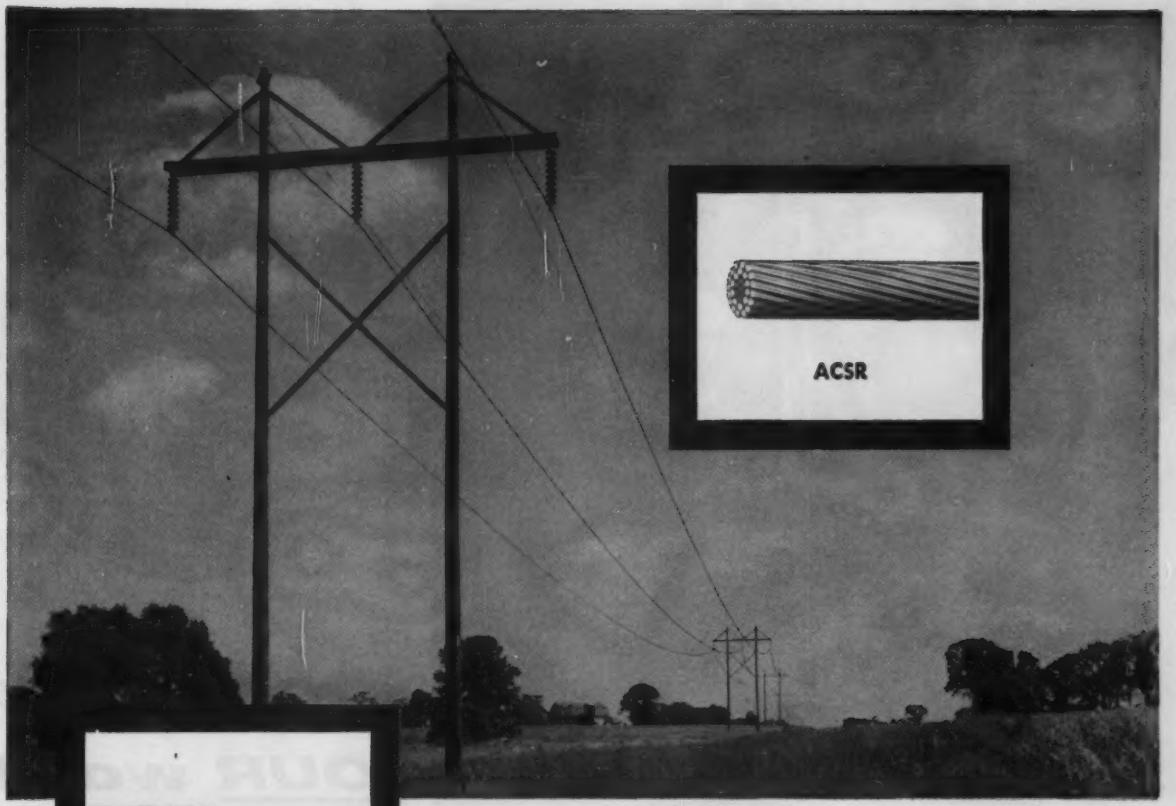
1099E

FOUNDED IN 1862

THE JAMES LEFFEL & CO.

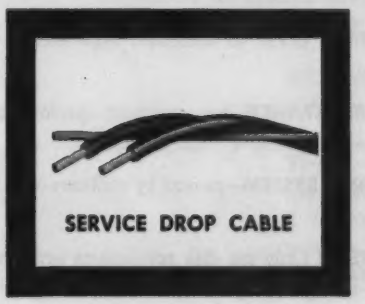
DEPARTMENT P • SPRINGFIELD, OHIO, U. S. A.

MORE EFFICIENT HYDRAULIC POWER FOR 95 YEARS



GENERAL CABLE

ALECTRAL ALUMINUM CONDUCTORS



Consistent, outstanding performance mark General Cable's ALECTRAL Bare and Insulated aluminum conductors. Manufactured to General Cable's high standards in all sizes. Bare ACSR and aluminum • Weatherproof aluminum and ACSR conductors • All types of service drop cables. ALECTRAL is available with a complete range of paper, rubber and thermoplastic insulations, backed up by over 75 years of General Cable's engineering and manufacturing experience.

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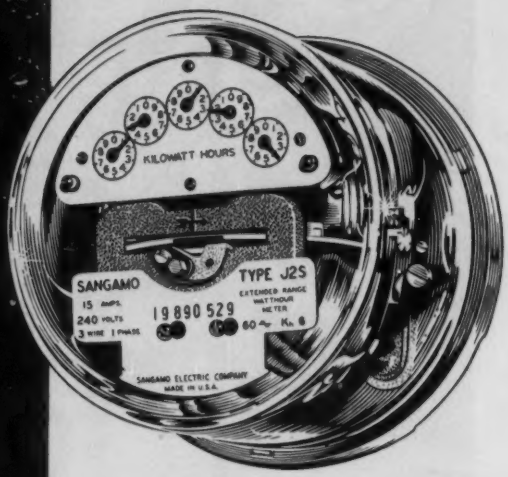
for quality and service . . . specify **GENERAL CABLE**



Don't take OUR word for it....

LOOK TO YOUR OWN RECORDS

for proof of watthour meter performance!

For all the *facts* about watthour meter performance—how your meters stand up in actual service... how accurately they retain their calibration... how many are damaged by high voltage surges... how quickly and economically they can be put back into service... and what it costs to keep meters on the line—there's no source more reliable than the meter accuracy records of your own Meter Department. These unbiased records are kept for your information as a company executive.

Sangamo J2 Meters provide:

ACCURATE MEASUREMENT from the lightest loads to 100 amperes for the entire life of the meter.

HIGH INSULATION LEVEL to withstand high voltage surges without damage.

CORROSION-RESISTANCE for optimum performance in humid, salt-laden or corrosive atmospheres.

LIFETIME BEARING SYSTEM—proved by millions of Sangamo Meters in service.

PLUS SLOW SPEED! Only ten disk revolutions per minute at full nameplate rating... another reason why the J2 is your best investment in a watthour meter.

JM 57-2

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

NEWS-SCOPE

FUTURE NEWS ▶

Chances dim for a TVA revenue bond financing bill this year. There has been a lack of urgency at the hearings. Added to that is the underlying opposition of the lawmakers to relax their hold on the agency's purse strings.

You'll be hearing of a gradual build-up in electric utility research programs—particularly in the operations and distribution planning areas.

Why not apply electronic computors to utility sales research? These modern-day tools are already getting a thorough workout in accounting, planning, purchasing, and stores departments. It is just a matter of time before the promotion and sales forces will be making more use of them.

Staff report on nuclear power plant licensing (p 68) adds another complicating factor to the legislative picture this year. There will likely be efforts to tie it up with the atomic insurance bill and the reactor acceleration program to make a single legislative package.

LATE NEWS ▶

Labor union members take fight against Power Reactor Development Co's proposed atomic power project to Monroe, Mich., businessmen. In a letter, they suggest businessmen ask insurance firms what effect the reactor will have on insurance charges for existing plants in the area.

Explosion and $400,000 fire destroy Iowa Southern Utilities Co's three-story building in Centerville. Cause was undetermined as EW went to press.

Preference clause issue highlighted hearings on Niagara redevelopment legislation before Senate public works subcommittee last week. Under consideration were two conflicting bills by Sen J. S. Clark (D-Pa.) and Sen Irving Ives (R-N. Y.). Both propose redevelopment by N. Y. State Power Authority. But Clark's measure would grant priority on power to public power groups while the Ives bill would allocate only a percentage of the power to such groups.

A bill to create public utility districts in Illinois is introduced in the state's House of Representatives. Districts, under five-man commission, would sell bonds to build electric power plants and develop distribution systems.

Atlantic City Electric plans to issue about $5 million in debentures convertible into common stock later this year, says Pres B. L. England at annual meeting. He also revealed 50% of firm's gross revenues come from residential customers and that only three other major U. S. electric utilities top this percentage.

BPA extends present base wholesale rate—$17.50 per kwyr—until December, 1958, at least, as result of payout studies okayed by the Interior Secretary.

The $6-million first mtg 4⅝% bonds ("A" Moody's rating) of California Electric Power are "moving along." So reported Kidder, Peabody & Co group as it was offering them at 100.40% to yield 4.60%. Previously the group had won the bonds with a bid of 99.661% . . . First Boston Corp group is offering 220,000 common shares of Iowa Electric Light & Power at $29 a share.

Congratulations . . . Blackstone Valley Gas & Electric elevates Robert D. Stuart from executive vice president to president. He succeeds David Daly, who has been named to the newly created post of chairman of the board of directors.

ELECTRICAL WEEK

A TWO-MINUTE

WATER RESOURCES ▶ **Engineers who plan and build this nation's water resource projects** must endure and study the various national and state policies which guide water resource development. Probably more than any other group, they are aware of the weaknesses, the conflicts—yes, and the strength of these policies. To bring their experience and wisdom to these policies, a distinguished panel of top flight engineers appointed by the Engineers Joint Council has written an up-to-date version of what they conceive to be the basis of "A Sound National Water Policy." A condensed version of the panel's draft is carried in this issue **(p 69).**

EVENTS ▶ **Utility money costs are holding the line**—but at a fairly high level. Bond interest rates are down slightly from the first two months of the year when utilities hit the market with numerous issues. Common stock remains a good financing bet if it can be made to fit into your structure **(p 62).**

Harsh spring weather continues to beat the Southwest utilities with blizzards and tornadoes **(p 64)** . . . EEI committee releases dramatic safety film **(p 67).**

WASHINGTON ▶ **Joint Congressional Atomic Energy Committee gets report** from staff which indicates that separate agency should be set up to handle licensing of nuclear power plants. Or, at least there is the implication that this should not be an AEC function **(p 65).**

GENERATION ▶ **Kentucky Utilities' scenic E. W. Brown steam station** is located close to the utility's load center. The site is a high bluff overlooking the Dix hydro station and a large reservoir. But because of its height above the reservoir and the wide fluctuation of the reservoir water level, the steam station will use a cooling tower. For design highlights of the initial 100-Mw plant, see **page 82.**

New use for fly ash? W. C. Thompson of Northern States Power's testing laboratory finds that a blanket of fly ash surrounding a buried black-iron pipe prevents corrosion during a 21-month test period **(p 84).**

TRANSMISSION ▶ **Extra high voltage transmission** discussion was one of the high points of the recent American Power Conference. For latest American, Swedish, and British developments see meeting coverage **(p 73).**

Hot spots might ordinarily be expected on high load factor pipe-type cable during an extended hot, dry spell. But when one crops up during the cooler months, it poses some vexing questions. Long Island Lighting, which operates some 36.6 miles of 69-kv pipe type cables and some 22.2 miles of 138-kv pipe-type cables, went in for some extensive tests when a hot spot developed in March of last year. While not all the questions have been answered, the utility's engineers have come up with some interesting findings. One tip: limit such cables to 50C maximum pipe temperature to avoid excessive loss of soil moisture and consequent run away condition. This applies to sustained dry spells during any time of the year. And the best general suggestion: operate the cables conservatively until additional information is obtained **(p 78).**

With the special strain plates developed by Seattle Department of Lighting, it is possible to convert the rotating-type air break switches in 26-kv lines from copper to aluminum. The plates eliminate the need for supplementary deadends of the aluminum conductor or replacing the 400-amp switches that won't take aluminum conductor **(p 90).**

DISTRIBUTION ▶ **Clever rig for cleaning strain insulators has been devised** by a division of the Appalachian Electric Power. The rig rotates the insulators at about 38 rpm

under a trickle of water while the operator applies steel wool or a steel brush to remove dirt deposits. It's worth looking into if you have more than 50 disk insulators to clean at regular intervals **(p 92).**

Substations and distribution lines installed today must be designed to fit into the heavier, larger system needed for the future. The Rural Electrification Administration comes up with some specific recommendations in a bulletin defining sound rural distribution system management. Wise planning, says the bulletin, must achieve: orderly system development to minimize waste due to premature inadequacy of lines and substations; system expansion that allows new investment in facilities to pace load growth and revenues **(p 77).**

SELLING ▶ **If you're toying with the idea of using a model home for your promotion program,** you'll want to read of Portland General Electric's successful venture. The all-electric home drew 5,000 visitors on opening day—more than 30,000 during a four week period. What's more, it brought the utility scads of favorable publicity. But Portland GE was careful to control all advertising and promotion activities in connection with the demonstration. You'll find some mighty handy information developed from experience **(p 96)** . . . An all-electric play house offers interesting exhibition possibilities **(p 98).**

MANAGEMENT ▶ **Long-term business outlook is exciting.** That's the impression left by speakers at the recent EEI Sales Conference. GE's Economic Researcher E. J. Klock sees energy sales rising at an average rate of 7% per year way into the future. Present kwhr sales will double by 1966, quadruple by 1976, says Klock. And present industrial sales averaging 6,000 kwhr per worker per year will rise to over 21,000 kwhr per worker in 1976. Arno H. Johnson of J. Walter Thompson advertising agency foresees a 50% increase in living standards over the next 10 years **(p 117).**

Better customer relations means better public relations. That's the thinking of John C. Faris, head of Union Electric's Customer Business Department. And it is a part of the philosophy behind the utility's "one stop" telephone service for customers which involves the centralization of customer service activities. You'll know why Union Electric customers have more smiles and fewer frowns after reading "Don't Keep the Customer Waiting." **(p 66).**

PEOPLE ▶ **W. S. O'Brien Robinson, Jr, is new board chairman** and general counsel at Duke Power Co . . . M. Nielsen is elected president of Babcock & Wilcox . . . Waldo E. Enns moves up to become chief system engineer at Portland General Electric **(p 130).**

MANUFACTURERS ▶ **Now it's plastic transformer bushings and tank covers** molded in a single piece. They're not for sale yet, but they're being tested on some 100 pole-type transformers this year **(p 124)** . . . Heavy-walled piping designed to carry steam at 5,000 psi and 1,200 F is being fabricated for Philadelphia Electric's new Eddystone supercritical station **(p 124)** . . . Underground distribution transformers which need no vaults are ready to market. A Texas manufacturer is offering these in capacity ranges 15 to 112.5 kva for conventional voltages **(p 126).**

NEW EQUIPMENT ▶ **New type hookstick operated distribution disconnect switch** is offered for 7.5, 15, and 23 kv systems. Switch has continuous current ratings of 200 and 400 amp . . . New line of d-c industrial motors and generators incorporating silicone insulation are on the market. Motors are rated from 1 to 150 hp and generators carry ratings from ¾ to 100 kw **(p 102).**

ENGINEERING TRENDS

Digital computers will complement analogs for power system studies, not supplant them as some have surmised. This was made clear in several sessions of the recent American Power Conference. According to Westinghouse Engineers R. W. Ferguson and D. B. Breedon, the digital device is best used where large amounts of data must be used repetitively in precise arithmetric computations, as for power system load flows. But economic dispatch is more speedily solved with analog computers devised for that specific application . . . Another digital application is to circumvent the tedious calculations otherwise required to select the best thermal cycle for a steam plant. This method was applied to Detroit Edison's River Rouge No. 1, a 260-Mw, 2,000-psi, 1,050/1,000F unit, according to R. K. Large of that utility and J. E. Gerngross of General Electric. . . . Illinois Power Co Engineers L. E. Jensen, T. W. Schroeder, and G. P. Wilson reported use of a digital computer to evaluate future plant sites, compute distribution transformer loadings from billing records, and analyze daily load curves. They contemplate using it also for tabulating system interruptions, forecasting fuel consumption, analyzing distribution voltage conditions, and numerous other statistical jobs.

Two 3,000-hp free-piston gas turbines recently installed in the converted Liberty Ship William Patterson will test claims that this principle doubles the fuel efficiency of conventional gas turbines at 25% savings in installed cost (EW, April 27, 1954, p 30). In this design a free-piston, reciprocating air compressor provides combustion air for the diesel cylinder which drives the pistons. Exhaust gases from this cylinder drive the gas turbine whose shaft hp is entirely available for ship propulsion.

Dc transmission seems secure for long submarine cables. Latest proposal of this type is to link the population centers of New Zealand's North Island across Cook Strait to the hydroelectric resources of rugged South Island. Initial objective is 600 Mw but 1,200 Mw is seen as the future need. Thus the New Zealanders follow closely the British cross-channel plan to adopt methods proved by the Swedes with their pioneering dc link to Gotland.

Gas-cooled reactors use large amounts of power for circulation because of the low specific heat and density of the gaseous coolant.

FROM EDITORS IN THE FIELD

Concrete replaces the deteriorating wood ties for the transformer tracks at Public Service of Colorado's Valmont Plant.

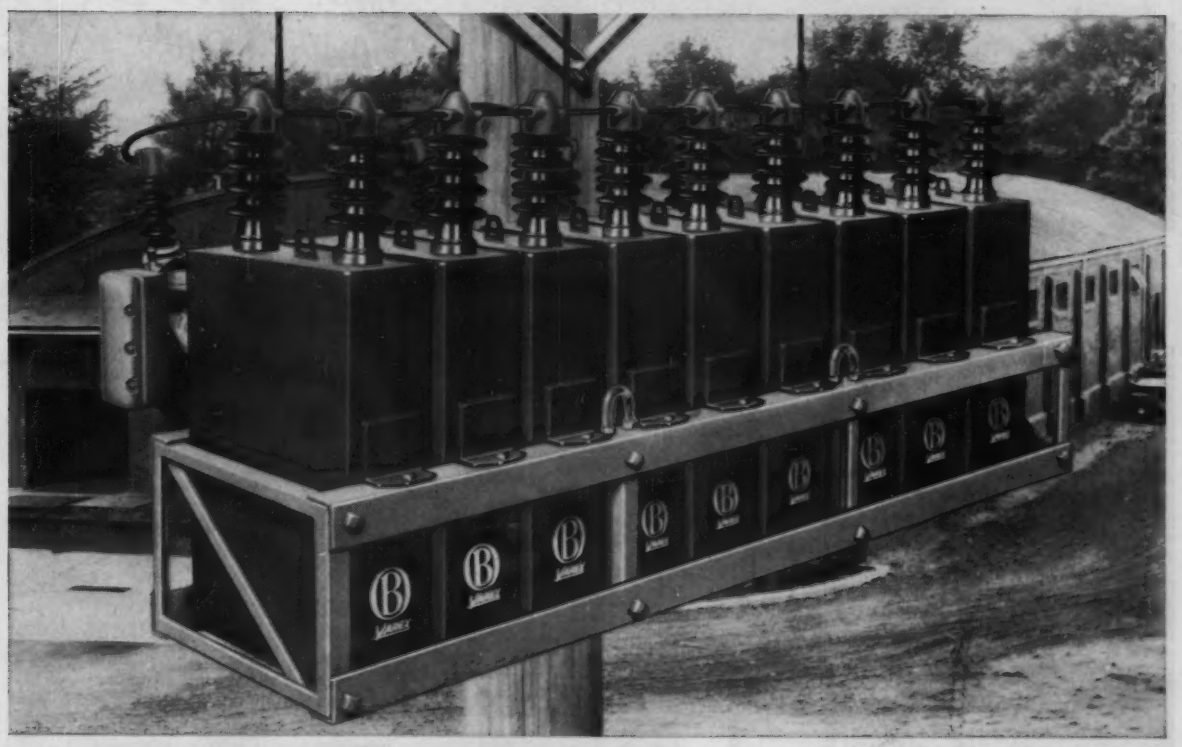
EHV power transformers serve also for metering with substantial savings on American G&E's 345-kv system. Compensation for IR and IX drops enables this metering connection to meet the usual 0.3% accuracy requirements.

Distribution moves toward 277/480-v service with continued conversion to a network at this voltage to replace the existing radial system in Peoria, Ill. Economic comparisons several years ago convinced Central Illinois Light Co of the economies in the new voltage.

O-B VAREX

a complete line of Shunt Capacitors to fill all your needs

Including Substation and Pole-Mounted Equipments made to NEMA standards



. . . available in both 25 and 50 KVAR units.

. . . eight voltages for each KVAR rating — 2400, 2770, 4160, 4800, 6640, 7200, 7620, 7960.

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. . . factory-assembled, pole-mounted equipments with in-line or rectangular configuration, up to 12 units switched and unswitched.

. . . factory-assembled, substation equipments for building banks of any desired size.

. . . units, hangers and equipments meet all national standards for dimensions and performance.

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—the cool capacitor

Ohio Brass

OHIO BRASS COMPANY, MANSFIELD, OHIO

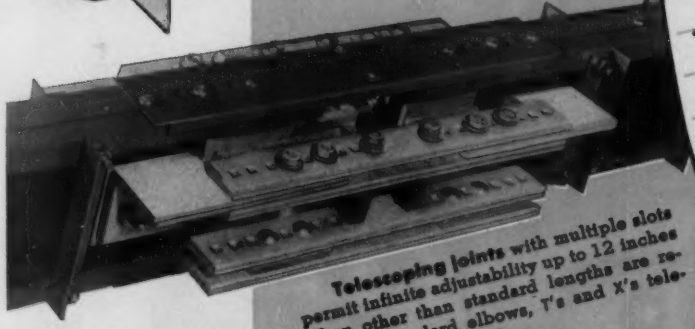
4751—H

Here's Why Square D's New Adjustable

ALUMINUM FEED-IN DUCT

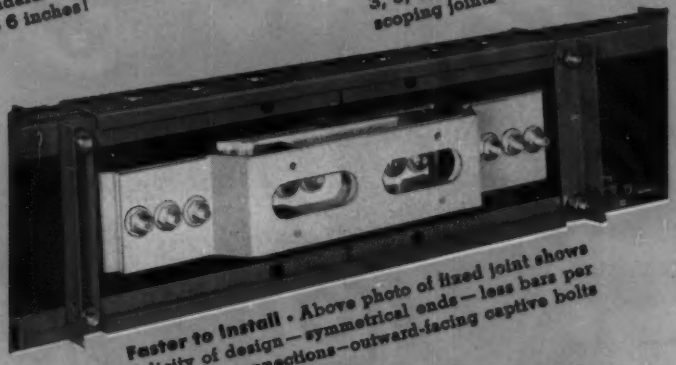
makes a lot of sense to me!

Needed-Rush!
85 feet; 3½ inches
1000 Amp, 3Φ4 wire
Feed-In Duct

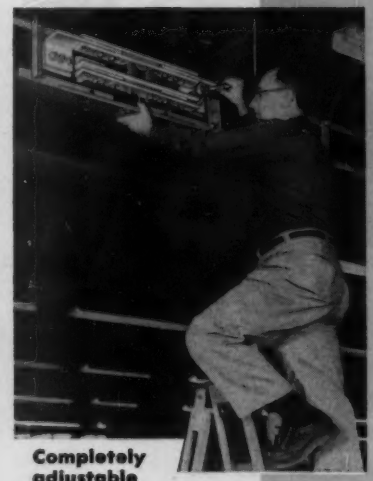


Telescoping joints with multiple slots permit infinite adjustability up to 12 inches when other than standard lengths are required. Standard elbows, T's and X's telescope up to 6 inches!

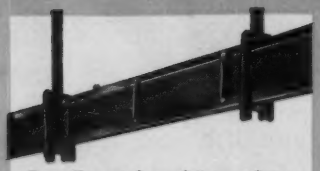
Fast delivery because any length requirement can be met with standard 3, 5, 7, or 10 foot lengths, plus telescoping joints



Faster to install • Above photo of fixed joint shows simplicity of design—symmetrical ends—less bars per phase—fewer connections—outward-facing captive bolts



Completely adjustable after it's hung. For example, if two ends terminate 6½ inches apart, connection can still be made with a telescoping joint



Totally enclosed for safety —at no price premium. No de-rating necessary. Square D's design eliminates need for ventilation

MORE DESIGN FEATURES

- Thinnest cross-section available! Tight spots, pipes and structural members present less problems
- Easy transposition of phases, using standard telescoping joint parts, for maintaining balanced voltage on long runs
- Certified short circuit tests by an independent testing laboratory have proved the superiority of Square D's continuously-supported bus design

Write for the complete story
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NOW...EC&M PRODUCTS ARE A PART OF THE SQUARE D LINE

SQUARE D COMPANY

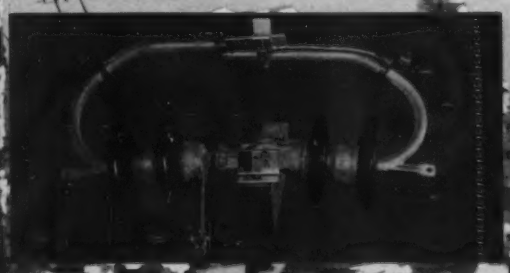
KPF switches operate smoothly, surely in all weather!

What's *your* weather? Arctic cold? Tropical rain? Parching desert sun? KPF switches operate unfailingly under all conditions. Their exclusive mechanical design permits a slight amount of movement before opening the switch so even extreme ice formations can be cracked off easily. Warpage cannot jam the switch, and lack of lubrication is never a problem.

KPF phase units consist of two rigid dead-end assemblies with rigid jumpers forming the switch arms. One is stationary, the other rotates to make or break the circuit. There's no delicate, complex mechanism to malfunction.

Their utmost design simplicity means KPF switches weigh less, install faster without extra bracing, need no servicing, cost less. They have proved themselves in almost 50 years of major system operation, on lines carrying 7.5 to 110 KV and amperages from 200 to 600 amperes.

Get the details, then order a test installation and see for yourself.



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AIR BREAK SWITCHES
Standard for nearly half a century

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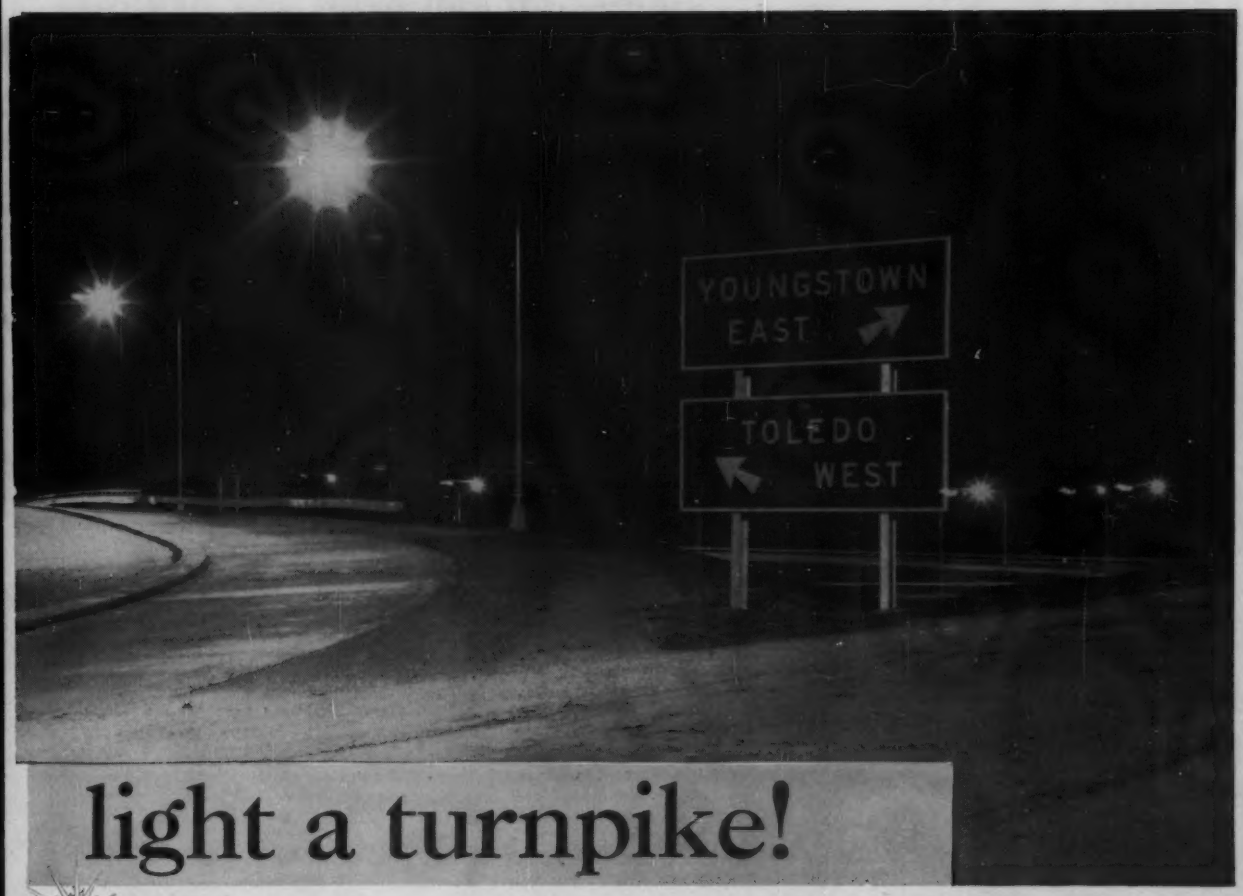
HERE'S the way to



light a turnpike!

The new Ohio Turnpike, spanning the state from Pennsylvania to Indiana, is a model of modern highway construction. And one of the outstanding features of this road is the lighting of the interchanges.

What an immense job it was to build this 241-mile road! Enough dirt was excavated to fill a two-lane tunnel 268 miles long. They dumped enough fill to cover 500 football fields to a depth of 28 feet. Carefully the bogs were drained, slides were stopped and the rock was blasted to make the great road possible.

Skillful engineering is apparent along every foot of the Turnpike—and this includes the selection of vital materials used to build it. Buried in the ground near the interchanges you'll find over half a million feet of Tiger Brand 3,000-volt internal shielded cable serving as main feeders. Many thousands of feet of Tiger Brand RR cable serve as bracket cable in the poles, and an additional quarter million feet of Tiger Brand cable grounds the entire system.

When you install Tiger Brand cable, you have gone a long way toward insuring a trouble-free wiring system.

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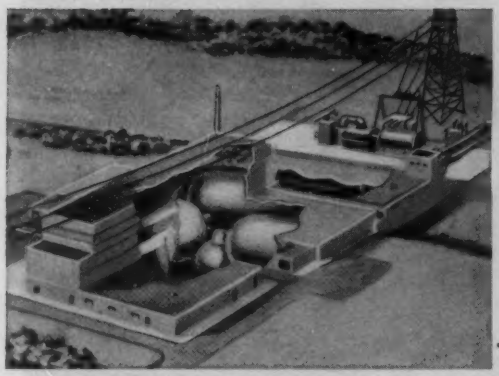
A STANDARD TIGER BRAND CABLE FOR EVERY SPECIAL JOB

- asbestos wire and cable
- mold cured portable cord
- shovel & dredge cable
- paper & lead cable
- varnished cambric cable
- interlocked armor cable
- special purpose wire & cable
- aerial, underground and submarine cable

USS

UNITED STATES STEEL

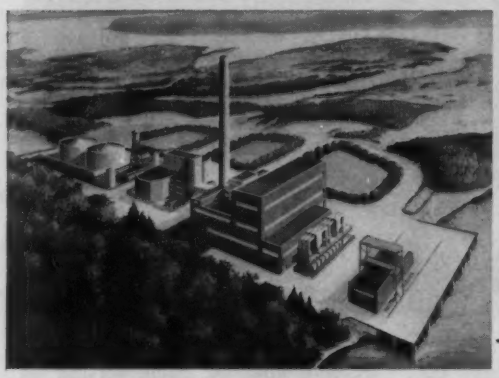
Three of America's LARGEST ATOMIC POWER PLANTS will use MAJOR COMPONENTS* by FW



60,000 KW SHIPPINGPORT PLANT
of the AEC and Duquesne Light Company

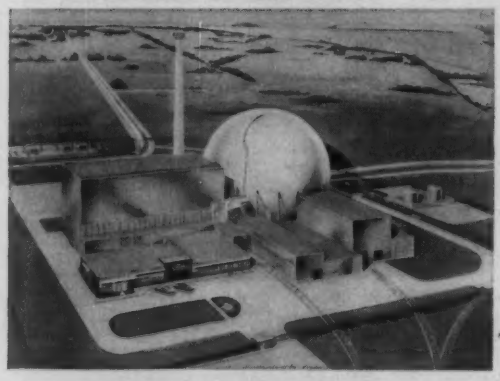
***Steam Generators.** Two of the four steam generators for America's first full scale commercial atomic power plant have been designed and fabricated by Foster Wheeler. They will convert heat from the pressurized water reactor into steam for operating the turbo generator.

***Pressurizer.** Also supplied by Foster Wheeler is the 18-ft high, 300 cu ft pressurizer used to maintain coolant loop pressure. It is designed for 2500 psig at 675 F and contains 342 electric immersion heaters for controlling operating pressure.



236,000 KW INDIAN POINT PLANT
of the Consolidated Edison Company

***Separately-Fired Superheaters.** Saturated steam from the pressurized water reactor will be superheated from 447F to 1000F by two Foster Wheeler oil-fired superheaters, each with a capacity of 1,075,000 lb/hr at 410 psia. Compared to operation with saturated steam direct from the reactor, addition of the superheat cycle will raise plant capacity from 140,000 kw to 236,000 kw and reduced estimated plant cost from $322 to $233 per kw.



180,000 KW DRESDEN STATION
of the Commonwealth Edison Company

***Primary Steam Separator.** Primary steam generated in the reactor will be separated from the water in a Foster Wheeler steam drum designed for a pressure of 1250 psia and capable of delivering 1,400,000 lb/hr at 1000 psia with a moisture content of not over 0.1%.

***Secondary Steam Generators.** Primary nuclear heated water will be converted to secondary steam for a reduced-pressure turbine stage by four Foster Wheeler steam generators with a combined capacity of approximately 1,190,000 lb/hr at 510 psia saturated.

IN addition to the above major nuclear components, Foster Wheeler know-how encompasses the design and fabrication of complete nuclear power plants of the aqueous homogeneous reactor type as well as specialized tank-type research reactors.

For further details on any of these items, write to *Foster Wheeler Corporation, 165 Broadway, New York 6, N.Y.*

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Unless you have this trademark . . .

YOUR UTILITY BODY IS PROBABLY OVERWEIGHT

One of the big differences in truck bodies is the steel they are made of. High-tensile steel gives bodies more strength per pound than unalloyed low carbon steel. More strength with about 75 percent of the weight. That's why this fact is important to you: *Holan is the only manufacturer using high-tensile steel in its standard utility bodies.*

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Strength and weight are two of the many advantages in the high-tensile steel Holan uses. Add copper, nickel, chromium, moly and phosphorus to low carbon steel and you have an altogether different product. Rust resistance of alloyed high-tensile steel is four to six times greater according to atmospheric corrosion tests. Paint and protective coatings last longer because small scratches aren't rapidly enlarged by lateral corrosion under the coating. And, when high-tensile steel receives a blow, it tends to spring back to shape. Low carbon steel tends to dent.

IT PAYS TO COMPARE

Extra weight, rust and dents represent extra money —out of your pocket. When you buy a service or construction body, it pays to see what it's made of.

Holan bodies and associated power equipment are the result of constant research . . . research that keeps Holan ahead of the field. And *everything* Holan produces is made of high-tensile steel. Look at all of the others and compare.

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COPPER with COPPER
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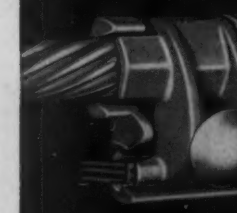
PAC-3
ACSR 8—2 Cu. 8—2

PAC-4
(formerly PAC-6—0)
ACSR 6—1 0 Cu. 6—2



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BLACKBURN PAC CLAMPS

ELIMINATE CORROSIVE SOLDERS, VOIDS AND FLUXES !

There are many satisfactory copper connectors for connecting copper conductors.

There are many satisfactory aluminum connectors for connecting aluminum conductors.

Blackburn's PAC clamps combine the features of a good copper connector and a good aluminum connector to give you the best copper to aluminum connector available.

Our exclusive method (Patent applied for) of pressure casting molten corrosion resistant aluminum alloy around specially treated pronged copper liners establishes an intimate, low resistance contact of the two metals without using corrosive solder.

The copper liners, which cannot be mated incorrectly, surround the copper conductor establishing a good copper to copper contact.

The aluminum grooves surround the aluminum conductors, establishing a good aluminum contact.

Adequate contact surface and conductor separation is built into Blackburn's PAC clamps to insure long-lasting, trouble-free copper to aluminum connections without setting up cold flow or galvanic corrosion.

Spring action is inherent in the design of PAC clamps and is supplemented with an extra-heavy spring lockwasher insuring permanently tight connections which will withstand temperature fluctuations.

Hot dipped galvanized steel hardware is standard. Aluminum hardware available on all but Catalog #PAC-3.

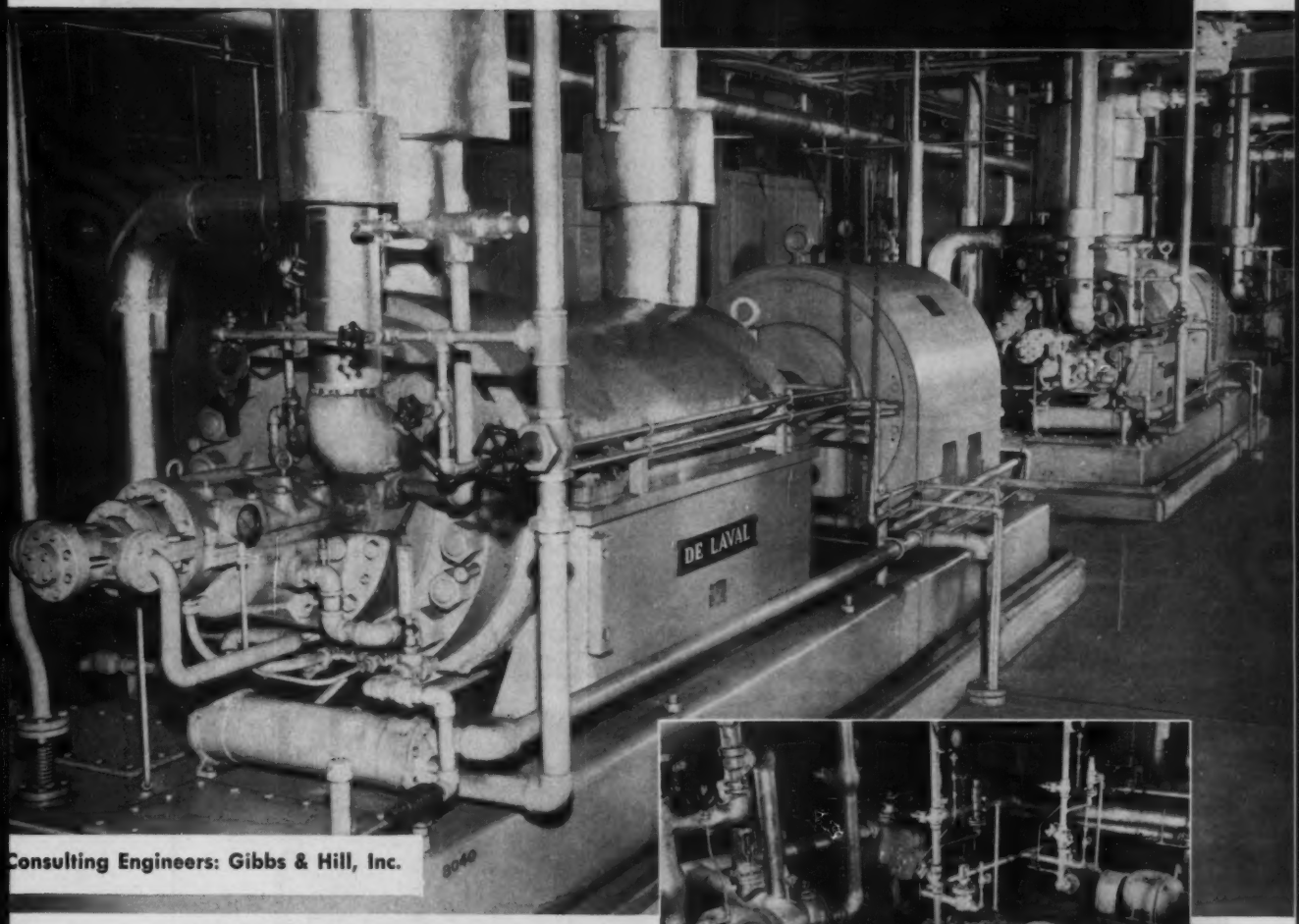
AVAILABLE THROUGH ELECTRICAL WHOLESALERS EVERYWHERE

JASPER BLACKBURN CORPORATION

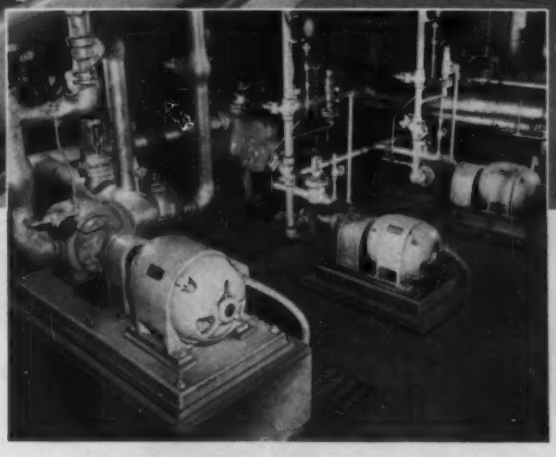
35 MADISON STREET • ST. LOUIS 6, MO. • PHONE: MAin 1-2821

Atlantic City Electric ... another utility using

DE LAVAL
BARREL TYPE BOILER FEED PUMPS



Consulting Engineers: Gibbs & Hill, Inc.



De Laval IMO rotary positive displacement pumps handle heavy fuel oil. They are used for standby operation.

Atlantic City Electric Co. and Gibbs & Hill, Inc., Consulting Engineers, know that they can count on De Laval reliability. That's why they selected three De Laval high pressure barrel type boiler feed pumps for the Deepwater Station in Penns Grove, New Jersey. These 10-stage units deliver 675 gpm, operating at 1762 psi with temperature at 287 F. The pumps are driven by 900 hp motors.

De Laval barrel type boiler feed pumps operate at pressures up to 5500 psi. These units offer many important design advantages, such as double volute diaphragm, individual diaphragm bolting, only one inner high-pressure joint, and bare shaft construction. Their dependability is proven by year in, year out service in public utilities and industrial plants.

Send for De Laval Bulletin 1506, which contains helpful data.

DE LAVAL *Boiler Feed Pumps*

DE LAVAL STEAM TURBINE COMPANY
861 Nottingham Way, Trenton 2, New Jersey

THE Nicopress SLEEVE WITH THE Nicopress TOOL

...GIVES YOU A PERFECT NICOPRESS SPLICE

For use on Copper, Copperweld, and All-Aluminum Conductors

Nicopress Sleeves and Tools Patented in U. S. and Foreign Countries. "Nicopress" Registered in U. S. and Foreign Countries.

The National Telephone Supply Company

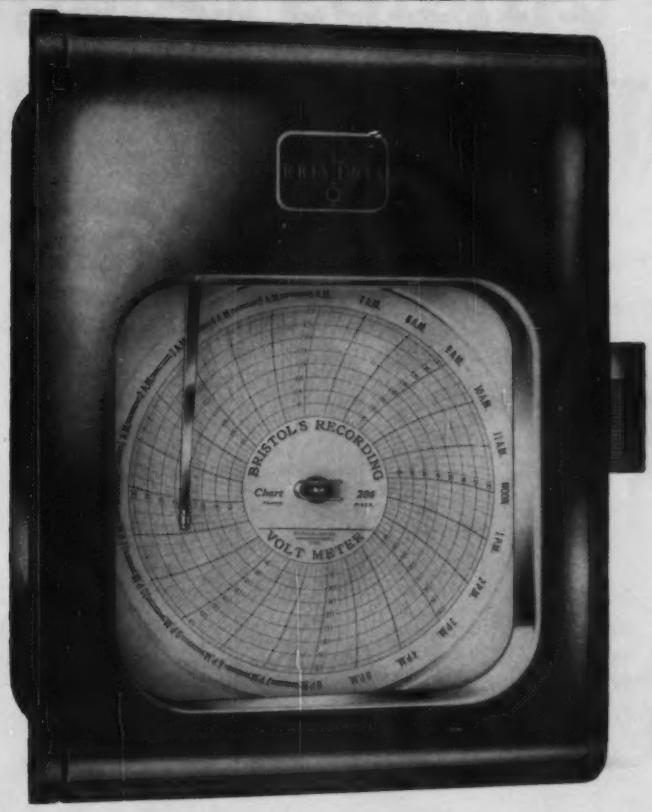
5100 SUPERIOR AVENUE • CLEVELAND 3, OHIO

Canadian Mfr.—N. SLATER CO., LTD., HAMILTON, ONT., CANADA

Export Distributor—INTERNATIONAL STANDARD ELECTRIC CORP., NEW YORK, N. Y.

WHAT'S NEWS AT BRISTOL . . .

How do you pick the right recording ammeter or voltmeter?



PERMANENTLY MOUNTED Bristol Voltmeters and Ammeters come in three models: interchangeable surface and flush, surface-panel, and flush panel.

The *right* choice for any voltage or current measurement and recording job is a Bristol Series 500 instrument.

Why Bristol? Mainly because for sheer accuracy the Bristol Recorders can't be topped. Among the reasons for that are:

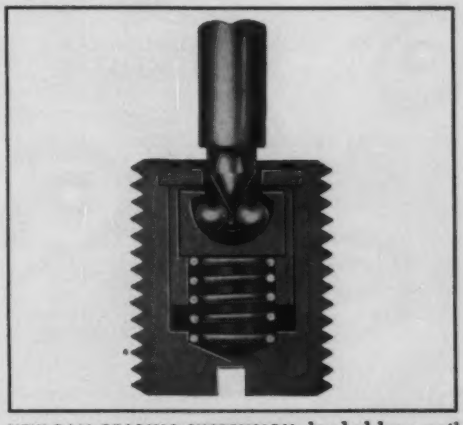
1. Low burden – the lowest burden of any round-chart recorder on the market.
2. Extremely high torque gradient.
3. Temperature compensated.
4. Shock-proof moving element mounting.
5. Leveling of instrument not critical.
6. Continuously legible recording of sudden changes – up to full scale value.

Also, Bristol's Series 500 Voltmeters and Ammeters are designed for easy use, with dust- and moisture-proof cases; quick-set chart hub for each chart changing; and snap-on chart plate.

Models offered that comply with ASA Specification C39.2.

Want more facts? Write for Bulletin E1111 to the Bristol Company, 116 Bristol Road, Waterbury 20, Conn. 5.19

SINGLE AND TWO-PEN PORTABLE BRISTOL RECORDERS are offered in two models: one chiefly for portable pole mounting and the other for general portable service.



NEW BALL-BEARING SUSPENSION, loaded by a coil spring, prevents damage even under severe mechanical shock. Corrosion-resistant stainless steel ball bearings are almost tool-hard.

BRISTOL

BRISTOL'S

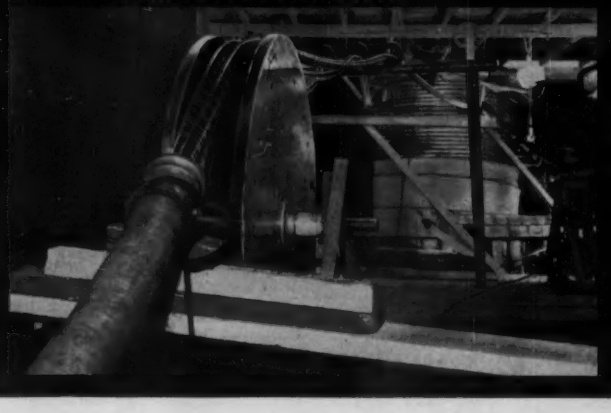
POINTS THE WAY IN HUMAN-ENGINEERED INSTRUMENTATION

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

Phelps Dodge

WIDEST RANGE OF HIGH

Pipe Type, Compression Cable, from 15 KV to 230 KV.



Low Pressure, Oil-Filled Cable, from 15 KV to 230 KV.

Consult Phelps Dodge for the correct answer to your requirements, regardless of voltage or type!

offers Industry's VOLTAGE POWER CABLE!

Only Phelps Dodge has manufacturing experience and operational "know how" with the entire range of high voltage cables which includes: oil compression, gas compression, high pressure oil, high pressure gas, pipe type cables; medium pressure gas, low pressure oil-filled, low pressure gas, submarine and solid type cables.

Low Pressure, Gas-Filled Cable, from 15 KV to 44 KV.

Submarine Cable, from 15* KV to 35 KV.

Solid Type Cable, from 15* KV to 69 KV.

*Lower voltage cables in this class also available.

PHELPS DODGE COPPER PRODUCTS CORPORATION

300 PARK AVENUE, NEW YORK 22, N. Y.

"We like the convenient storage characteristics of POC Bushings ---no special procedure or special handling is required."

"These totally-enclosed oil-filled bushings for lower voltages will surely create a trend."

"We gave it more severe tests than any other bushing we ever tested --- and we approve it without modification or alteration."

"THE CADILLAC OF BUSHINGS!"

"Excellent Design."

"AN EXCELLENT DESIGN, AND MANUFACTURED IN THE BEST OF FACILITIES."

"An ideal design, and well-suited to applications where existing bushings cannot be used."

"A superior bushing, but we'd expect nothing less from Lapp."

"Seems to be an excellent bushing; we can find no faults whatever."

APPROVED and ACCEPTED

Lapp POC* BUSHING

*PAPER-OIL CONDENSER TYPE TOTALLY-ENCLOSED CORE ASA STANDARD

In its first six months after announcement, the Lapp POC* Bushing has won the enthusiastic endorsement of utility engineers and equipment manufacturers from coast to coast. Rigorous characteristic and performance tests have been conducted in customer laboratories or in the Lapp laboratory under customer supervision. Practically every utility and every equipment manufacturer who have seen this bushing have placed it on Approved or Standards Lists—or tell us they are in process of approving it.

Lapp POC* is the bushing design of the future —ready to serve you reliably today.

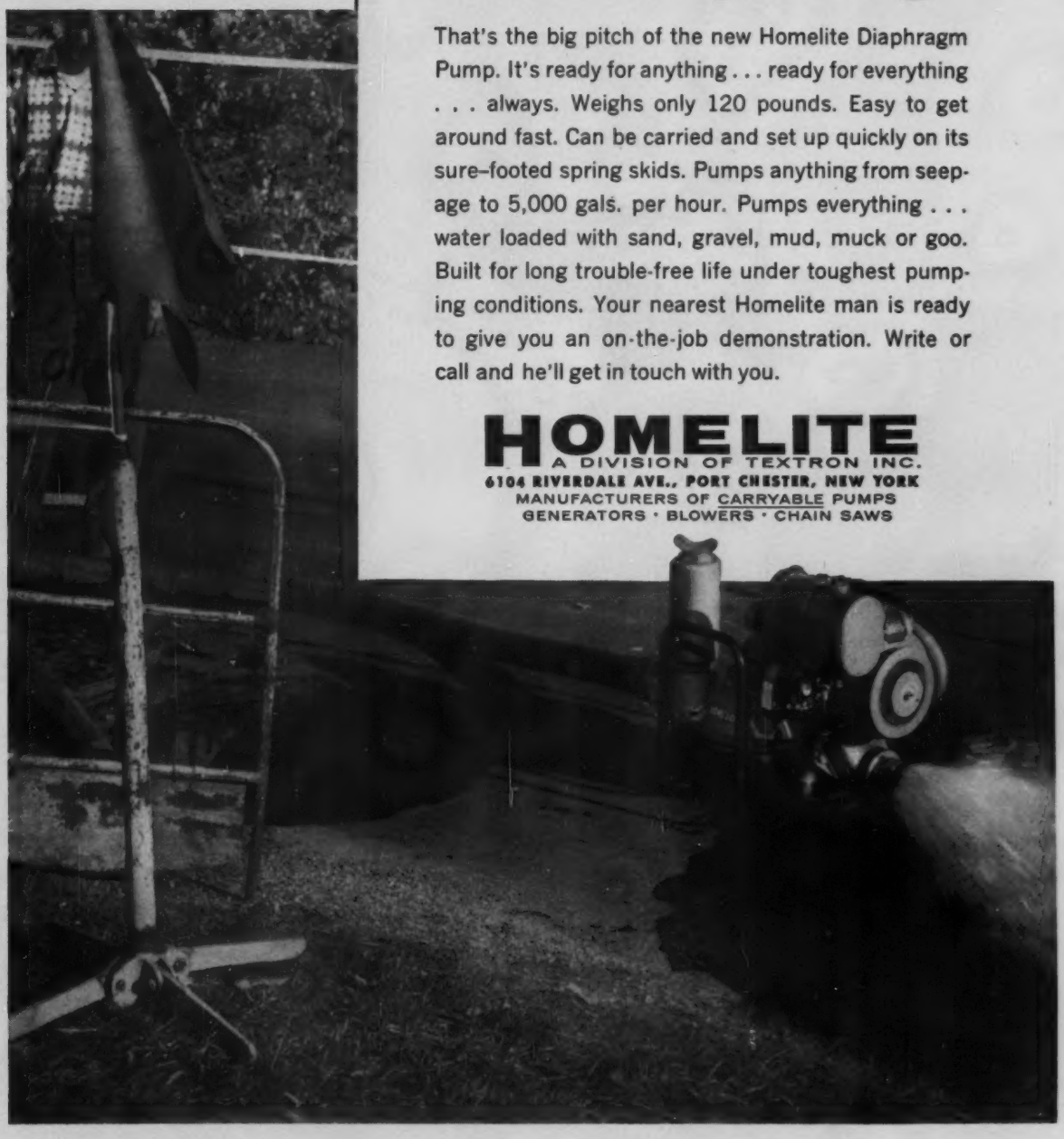
Lapp Insulator Co., Inc., Le Roy, N. Y.

READY

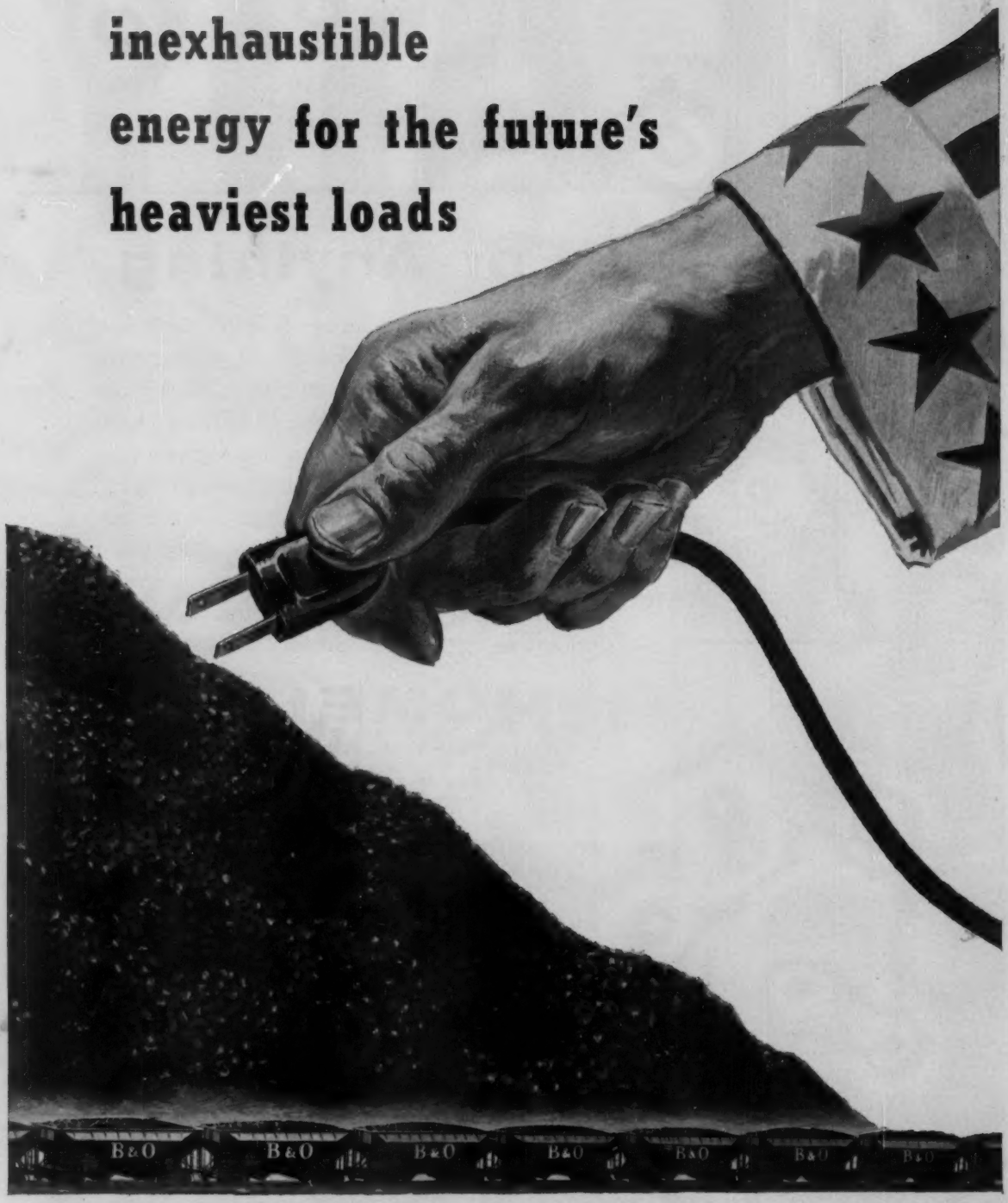
For Anything

That's the big pitch of the new Homelite Diaphragm Pump. It's ready for anything . . . ready for everything . . . always. Weighs only 120 pounds. Easy to get around fast. Can be carried and set up quickly on its sure-footed spring skids. Pumps anything from seepage to 5,000 gals. per hour. Pumps everything . . . water loaded with sand, gravel, mud, muck or goo. Built for long trouble-free life under toughest pumping conditions. Your nearest Homelite man is ready to give you an on-the-job demonstration. Write or call and he'll get in touch with you.

HOMELITE
A DIVISION OF TEXTRON INC.
6104 RIVERDALE AVE., PORT CHESTER, NEW YORK
MANUFACTURERS OF CARRYABLE PUMPS
GENERATORS · BLOWERS · CHAIN SAWS



inexhaustible energy for the future's heaviest loads



B&O **BITUMINOUS COALS FOR EVERY PURPOSE**

Ask our man! BALTIMORE & OHIO RAILROAD—BALTIMORE 1, MD. PHONE LExington 9-0400

WAGNER

FORM W

DISTRIBUTION TRANSFORMERS

- SMALLER IN SIZE
- LIGHTER IN WEIGHT
- COLD ROLLED STEEL CORES
- BONDED COIL STRUCTURES
- ROTARY TAP CHANGERS
- SHUR-SEAL COVERS
- DOUBLE LOCKED BUSHINGS
- UNIVERSAL TERMINALS
- SEAM WELDED STEEL TANKS
- POLE MOUNTING THRU 167 KVA

...everything you need for *DEPENDABLE POWER DISTRIBUTION!*

Wagner

FORM W

DISTRIBUTION

Smaller in size - lighter in weight - with all the mechanical and electrical

Since 1891, just nine years after the first central station, Wagner has been building fine transformers . . . constantly developing better transformers.

Today's Wagner Form W Distribution Transformer is exactly right for modern distribution systems. Its small size and light weight make it easy to handle—to store—to mount on poles.

Form W Transformers come in a complete range of single phase ratings, 500 kva and smaller, 69 KV and below. All Form W Transformers, in ratings 3 through 167 kva, 15 KV and below, are designed for pole mounting.

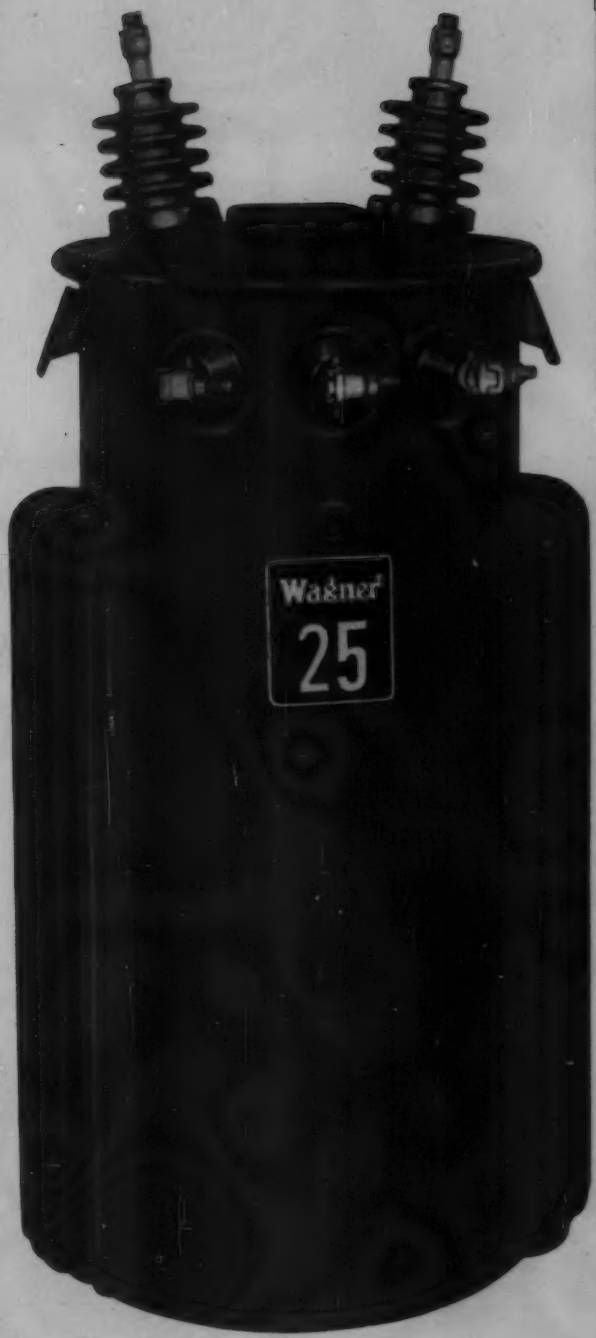
You can choose either conventional or protected type Form W Transformers for your distribution lines with full confidence that they will pay dividends in longer service life.

Bulletin TU-141 gives complete information on Wagner Form W Transformers. Write for your file copy today.

Wagner Distribution Transformers - the choice

TRANSFORMERS

features that mean...
EASIER INSTALLATION...
LONGER SERVICE LIFE!



ROTARY TAP CHANGER

Positive action . . . pre-loaded spring maintains constant pressure between the moving contact and the tap studs. Tap changer is easily accessible through cover hand hole . . . operating handle and index plate are above oil level.

FORM W CONSTRUCTION

CORES are of cold rolled oriented grain transformer steel, specially annealed to obtain the lowest possible magnetic losses. Cores are cut into two turn sections, which are assembled through and around the coils.

COILS are wound of pure copper wire or strip. High dielectric insulating material is used between layers in the high voltage and low voltage windings. This insulation has crimped edges which hold the windings accurately in place to permanently maintain electrical clearances.

BONDED INSULATION

An improved thermo-setting material for layer, channel, and barrier insulation is bonded to the coil conductors to give the coils great mechanical and electrical strength.

ENDPLATE STRUCTURE

The completed Form W element is clamped in a light but strong endplate structure which holds all parts securely in position and provides a mounting for the tap changer and lead supports.

of leaders in the electric

SHUR-SEAL CLAMPING RING

Sealing gasket, held in place by retaining ring on cover, is uniformly compressed around entire circumference.

Keeps transformer sealed air tight . . . no atmospheric moisture or dust particles can get inside. "Breathing" is completely prevented. Yet the cover may be easily removed by loosening a single bolt.

HIGH VOLTAGE SIDEWALL BUSHING

Permits the use of either copper or aluminum conductor. Insulating knob is designed for safer, faster, easier connections, without tools. Porcelain and terminal are locked in position.

LOCKED LOW VOLTAGE BUSHING

The bushing and terminal are key-locked to prevent turning when terminals are tightened. Eliminates loose terminal connections that could cause internal short circuits. Takes either copper or aluminum conductor.

WINDING TEMPERATURE OVERLOAD INDICATOR*

Gives advance warning of overloads approaching the danger point before an outage occurs. Indicator is actuated by winding temperature—no time delay as with indicators actuated by oil temperature.

* Can be furnished on all Form W Transformers 3 to 100 kva.

Wagner

FORM W

SMALLER SIZE—LIGHTER WEIGHT

Now Form W Transformers are up to 17% lighter—18% shorter than previous Form W models in the same ratings. They are encased in seam welded sheet steel tanks with fewer sharp edges and brackets where rust can start. Ratings of all transformers are clearly shown on the tank.

Wagner Distribution Tra

DISTRIBUTION

Smaller in size - lighter in weight - with all the mechanical and electrical

Since 1891, just nine years after the first central station, Wagner has been building fine transformers . . . constantly developing better transformers.

Today's Wagner Form W Distribution Transformer is exactly right for modern distribution systems. Its small size and light weight make it easy to handle—to store—to mount on poles.

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You can choose either conventional or protected type Form W Transformers for your distribution lines with full confidence that they will pay dividends in longer service life.

Bulletin TU-141 gives complete information on Wagner Form W Transformers. Write for your file copy today.

ransformers - the choice

TRANSFORMERS

features that mean...
EASIER INSTALLATION...
LONGER SERVICE LIFE!

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of leaders in the electric

s

c utility industry

WAGNER

FORM W

TRANSFORMERS

will meet your

distribution

system

requirements

*

Call the Wagner

sales engineer

in your area

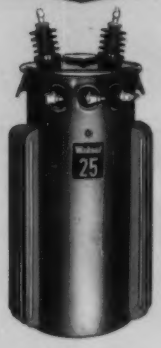
for complete

information

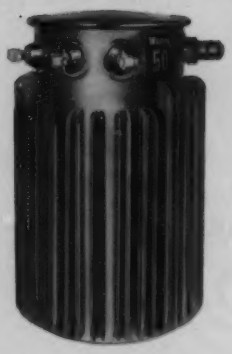
Wagner Pole Mounted Type FORM W TRANSFORMERS

will assure service continuity for your distribution system

TYPE HEB—5000 Volts and Below
Typical Construction—3 through 15 KVA



TYPE HEK—5001 to 15000 Volts
Typical Construction—25 through 50 KVA



TYPE HEB—5000 Volts and Below
Typical Construction—25 through 50 KVA

TYPE HEK—5001 to 15000 Volts
Typical Construction—75 and 100 KVA

TYPE HEB—5000 Volts and Below
Typical Construction—75 and 100 KVA

TYPE HEK—5001 to 15000 Volts
Typical Construction—167 KVA

Wagner Electric Corporation
SERVING INDUSTRY SINCE 1891

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation
6400 Plymouth Ave., St. Louis 14, Mo., U. S. A.

T57-4

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

Brand New!

Ready Now!

CRESCENT PIPE WRENCHES

HEAVY DUTY PATTERN... A really heavy duty wrench, far exceeding U. S. Government Type II Specifications. Hook and Heel Jaws of special analysis steel, triple-heat treated. Alloy handle combines high tensile strength and light weight. Seven sizes, 6" to 24". Finished with flat surfaces polished...red enamel handles.

NORMAL DUTY (STILLSON) PATTERN... Meets U. S. Government Type I Specifications. Fully heat treated, forged steel handle and jaws. "Floating" housing assures positive grip and instant release. Six sizes, 6" to 24". Finished with flat surfaces polished...red enamel handles. Your jobber has these tools in stock now.

CRESCENT and CRESTOLOY TOOLS are sold by hardware dealers and industrial distributors everywhere. Look for the bright yellow Crescent Display panels and select from one of the world's greatest assortments of quality hand tools.

Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK

New pressure-splice method insulates even this complex splice!

"SCOTCHCAST" pressure method has widest application range of any insulating system!

THIS "UNIPACK" container holds the laboratory-correct mixture of "SCOTCHCAST" Resin No. 4 to make a fast, factory-quality splice in the field. This new Pressure-Splice method affords the utmost in excellent physical, electrical and moisture protection—consistently, splice after splice—*with any combination of cables and any combination of insulations.*

THIS new 3M Pressure Gun makes the "SCOTCHCAST" method practical, simple, and positive for any type of field splice where the size, shape, position, or inaccessibility of the splice make other splice insulating methods difficult. This gun was specially designed for the new Pressure-Splice method; makes insulating splices a neat, clean, quick, and *permanent* job.

SEND FOR *complete information on the new "SCOTCHCAST" Pressure-Splice method for field use. Just write on your letterhead to: 3M Co., St. Paul 6, Minn., Dept. BV-47.*

REG. U.S. PAT. OFF.
SCOTCH BRAND Electrical Products

by the makers of
SCOTCH BRAND No. 33 Electrical Tape

The term "SCOTCH" and "SCOTCHCAST" are registered trademarks of Minnesota Mining and Manufacturing Co., St. Paul 6, Minn. Export Sales Office: 99 Park Ave., New York 16, N. Y. In Canada: P.O. Box 757, London, Ontario.

PRODUCT OF 3M RESEARCH

GENERAL ELECTRIC ML-32 STEP VOLTAGE REGULATORS on the line at the substation of a large midwestern utility.

Midwest Utility Finds That General Electric ML-32 Voltage Regulators Require

"PRACTICALLY NO MAINTENANCE"

By Bob Bry, Manager—Marketing Voltage Regulator Product Section

A large midwest electric utility has been installing a great many of our ML-32 step voltage regulators. We asked them why, and here is what they told us:

One of their Division Superintendents said: "I like the ML-32 from the maintenance point of view. There is practically no maintenance as compared with other types or makes of regulation. I feel we save time and money because it isn't as necessary to continually check the G-E regulators."

He feels that big dollar savings have resulted for his company because "installation of the G-E regulators has cut down on the number of maintenance trips we've had to make to outlying areas and the oil field sections."

Another reason for this utility's preference for ML-32 regulators is the G-E Load Bonus which allows them to increase current capacity while the regulator is energized.

Another one of their Division Superintendents put it this way: "I especially like the ML-32's Load Bonus feature because, in cases where the load builds up and exceeds the regulator rating, we can use Load Bonus to obtain a capacity of 160%. In other words, in cases where the load builds up, we set the taps up on the transformer and set the regulator to boost 5% and buck 10%."

Reduced maintenance costs and increased current capacity can save your company money, too. Learn more about this new G-E regulator by asking your G-E representative or by writing Section 423-22, General Electric Co., Schenectady 5, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

New A-Line models range from ½-ton Pickups through 33,000 lbs. GVW Six-Wheelers.

NEW ACTION-STYLING! MORE USABLE POWER!

Here is the crowning achievement of fifty years of quality truck production—the great new Golden Anniversary INTERNATIONAL Trucks!

They're *Action-Styled* with fresh, clean functional lines that set a new style pace.

They're powered by new engines that put out more *usable* horsepower—including the most powerful "six" available in its field! They have exclusive new cab mountings for quieter, more level ride. New brakes, new steering, new frames—and many other new features.

The result is a new line of trucks that—more than ever before—are built to cost *least* to own!

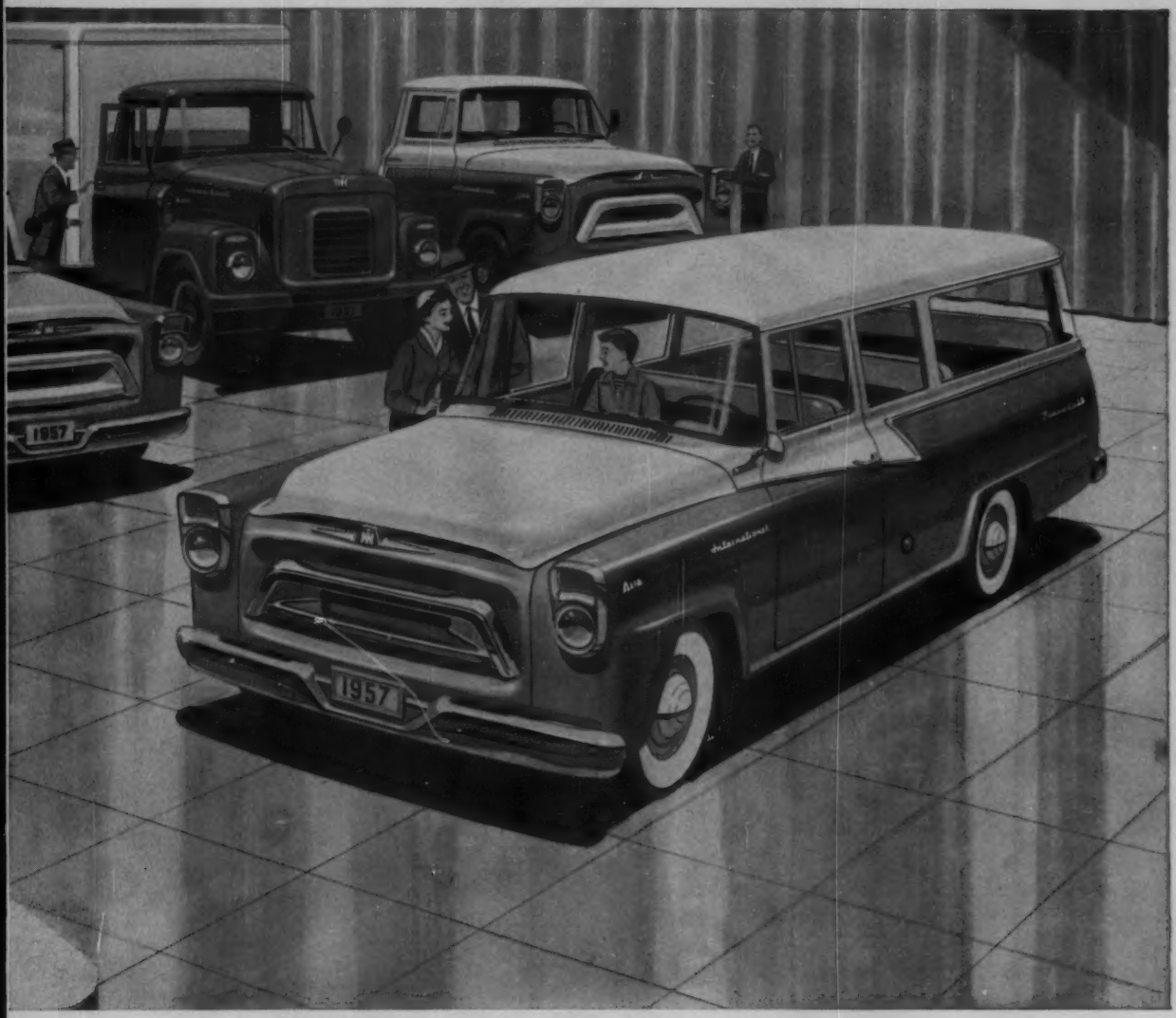
See and drive these newest INTERNATIONALS *today!* International Harvester Company, Chicago.

Trucks Unlimited...Powered for Modern Traffic...Plus Modern Comfort

Handsome "Golden Jubilee" Pickup with the *longest* all-steel body in its class. Only Panel with third door. New 8-passenger Travelall® models. New cab-forward models with ideal 89-inch BC dimension. Tractors to 48,000 lbs. GCW. Wide range of all-wheel-drive trucks.

Redesigned engines produce *increased* power without strain from new combustion chamber and valve position . . . more usable power that's "bred for the job". . . at low rpm to keep operating and maintenance costs low. New quick-starting 12-volt ignition.

Biggest windshield—1,181 sq. in.—and *widest* cab in their class! New "Silent-Vent" door wings. New, wider front and rear springs. Exclusive level-riding 5-point cab mounting. Bigger brakes with more lining area, larger cylinders and boosters for quicker, easier stops.



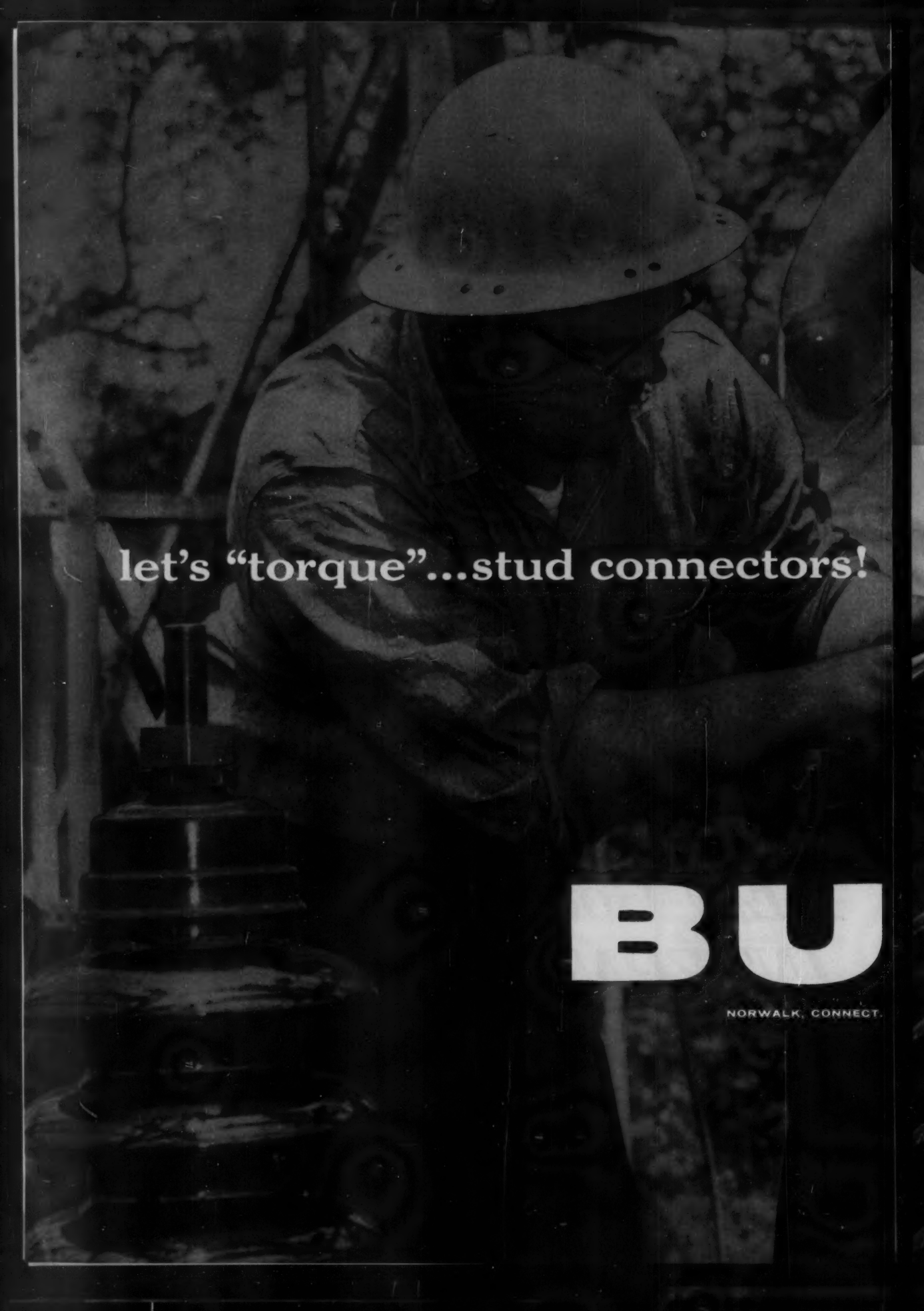
Other INTERNATIONALS, to 96,000 lbs. GVW, round out the world's most complete line.

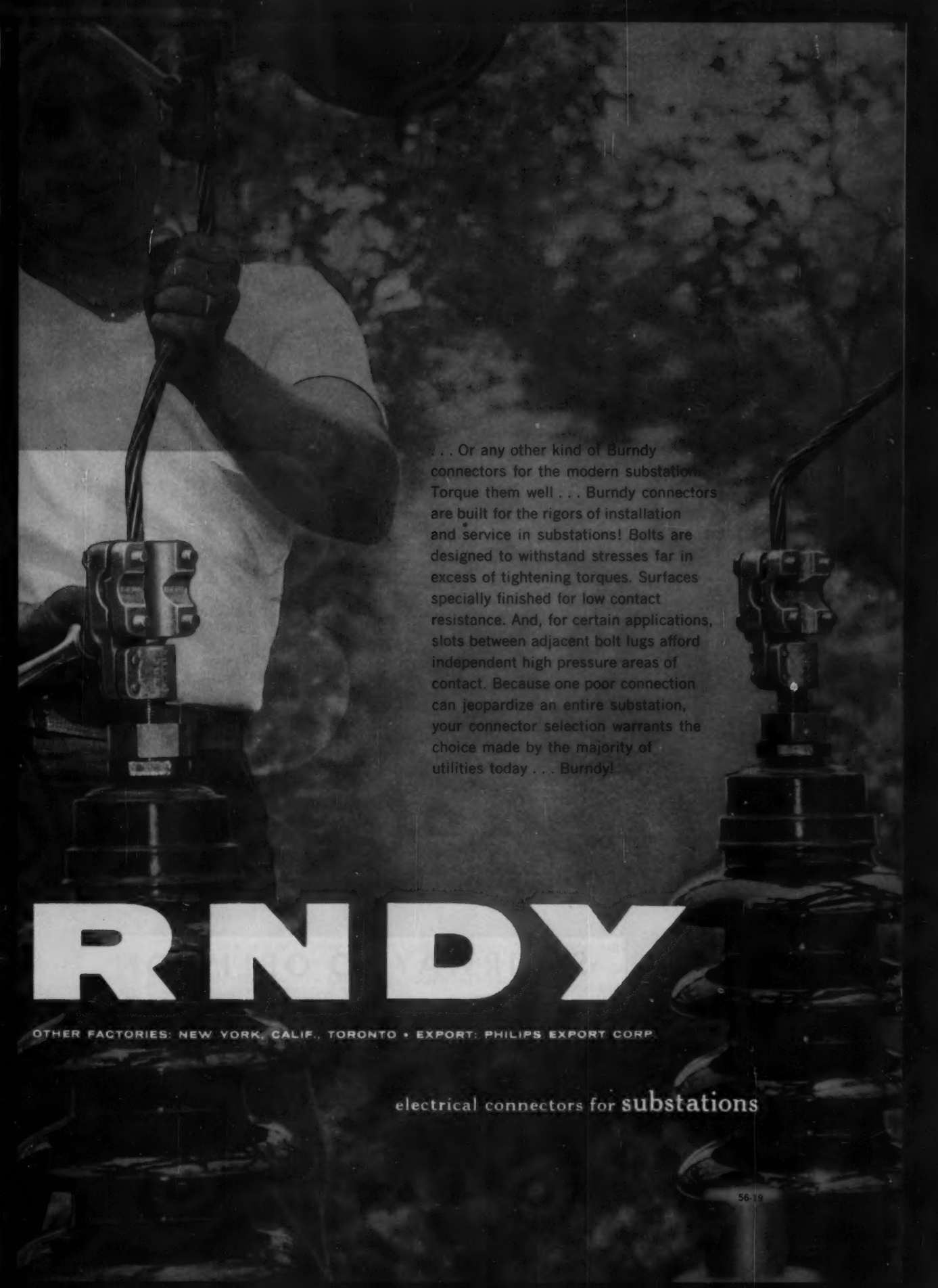
NEW Golden Anniversary INTERNATIONALS

Cost least to own!

50 YEARS OF TRUCK QUALITY
1907 1957
INTERNATIONAL TRUCKS

Motor Trucks • Crawler Tractors • Construction Equipment
McCormick® Farm Equipment and Farmall® Tractors


let's "torque"...stud connectors!
BU
NORWALK, CONNECT.


. . . Or any other kind of Burndy connectors for the modern substation. Torque them well . . . Burndy connectors are built for the rigors of installation and service in substations! Bolts are designed to withstand stresses far in excess of tightening torques. Surfaces specially finished for low contact resistance. And, for certain applications, slots between adjacent bolt lugs afford independent high pressure areas of contact. Because one poor connection can jeopardize an entire substation, your connector selection warrants the choice made by the majority of utilities today . . . Burndy!
RNDY
OTHER FACTORIES: NEW YORK, CALIF., TORONTO • EXPORT: PHILIPS EXPORT CORP.
electrical connectors for substations
56-19

STAIRWAY TO OBLIVION

Magne-valve Station-type Arresters use the magnetic force produced by coils placed above and below the interrupting gaps to sweep the power follow-current arc to extinction in less than a half cycle. Arc moves progressively from main gap to as many as 14 gaps in series. This picture, from a high-speed movie taken at 4000 frames per second, shows the arc just prior to interruption.

Proved Magne-valve principle gives

3 TIMES GREATER DISCHARGE CAPACITY

with General Electric Station Arresters

You get over 3 times greater long duration discharge capacity with General Electric station-type lightning arresters. You also get their ability to handle direct stroke currents as high as 150,000 amperes (5 x 10 μs wave). There's plenty of thermal endurance to withstand multiple strokes and severe switching surges. Available ratings cover all system voltage requirements from 3 to 345-kv.

High protective efficiency is made possible by the General Electric Magne-valve principle first developed by G-E engineers in the mid-1940's. This principle combines the valve action of greatly improved Thyrite* disks with the unique magnetic action of series gaps shown on the opposite page.

Magne-valve has revolutionized many important aspects of equipment design and application. It made possible reduced insulation two steps below "Full B.I.L." for power transformers rated 138-kv and above, with resultant large savings in apparatus investment. It greatly liberalizes the permissible separation between the arrester and apparatus, and gives an *extra* margin of protection for unshielded, or inadequately shielded, equipment. It also extends the life of older apparatus having subnormal insulation.

The new Magne-valve Station-type Arresters represent the most significant advance in lightning protection since General Electric first introduced arresters utilizing Thyrite over 25 years ago. For complete information on what these new arresters can mean to you, get in touch with your nearest G-E Apparatus Sales Office, or write for Bulletin GEA-1304 to General Electric Company, Section 432-22, Schenectady 5, New York.

*Reg. trade-mark of General Electric Co. for molded resistance material.

Magne-valve arresters for every application R. W. Frahm, Manager of Marketing—Lightning Arrester and Cutout Section, displays representative samples of the complete Magne-valve line.

Progress Is Our Most Important Product

GENERAL ELECTRIC

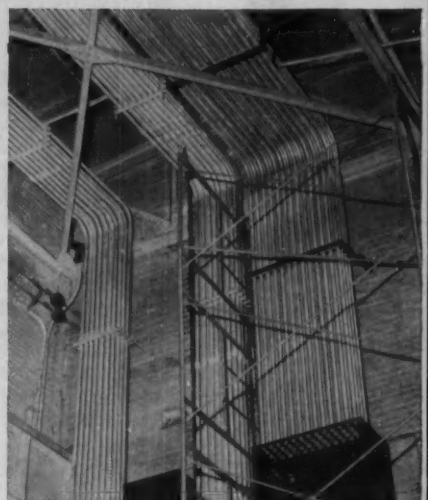
The best costs less installed

It makes cents to install
EASY-TO-BEND REPUBLIC ELECTRUNITE E.M.T.

Great dependability and ease of installation . . . *sound* reasons for changing to Republic ELECTRUNITE E.M.T.! More and more utilities find it the practical way to eliminate difficult, costly installations of electrical conduit!

Lightweight Republic ELECTRUNITE® E.M.T. speeds handling, lowers cost! Exclusive "Inch-Marks" help to make precise bends quickly and easily. Surfaces are left smooth and unwrinkled after bending because Republic ELECTRUNITE E.M.T. is uniformly ductile. The exclusive "Guide-Line" keeps bends in the same plane. The use of compression-type fittings means no threads to cut, no runs to turn! And, since the tightly adhering galvanized seal remains unbroken, you get maximum protection against corrosion!

Hundreds of millions of feet of Republic ELECTRUNITE E.M.T. have been installed in concrete. Installations made more than 25 years ago continue to give trouble-free service. Check further the advantages of Republic ELECTRUNITE E.M.T. It's produced to ASA Specifications C-80.3, Federal Specifications WW-T-806 and carries the Underwriters' Seal of Inspection. Send for your free copy of the 76-page booklet of ELECTRUNITE bending instructions.



20 YEARS OF DEPENDABLE SERVICE! That's why Iowa-Illinois Gas and Electric Company again specified Republic ELECTRUNITE E.M.T. for its new 69-kv substation at the Moline Generating Station. They and many other utilities appreciate its low initial cost and ease of installation.

REPUBLIC STEEL

Steel and Tubes Division

213 E. 131st Street • Cleveland 8, Ohio

Why be half safe?

Specify AUTO-SPEED interruption . . . 3E Air Interrupter Switches

Howard Shatzer, 3E field engineer, checking an Air Interrupter Switch before shipment.

What is **Auto-speed interruption** . . . an automatically produced interruption that always occurs at the same point in the switching operation, and always takes the same time (one-half cycle). Human error is eliminated from the switching action by a trigger spring mechanism which trips the switch at a pre-set point. Contacts are separated inside a dry type interrupter unit.

Specify safety for personnel and equipment. No exposed Arc. 3E Air Interrupter Switches will not produce external arcing dangerous to men or equipment.

Specify economy Costing less than circuit breakers and with interrupting capacity not found in air break disconnects, 3E Air Interrupters are ideal for . . . interrupting magnetizing charging current of transformers . . . interrupting charging current of lines and busses . . . interrupting exciting current of feeder regulators . . . interrupting load currents to rated capacity . . . sectionalizing feeders and distribution circuits.

Specify Engineering Ability 3E's staff of engineers is experienced in adapting or combining equipment for complete switching centers or additions to existing units. Designing for unusual needs . . . corrosive or dusty atmospheres, unique space requirements, portable units, or carefully calculating tomorrow's expansion requirements . . . we are geared to handle the unusual.

Howard Noble, 3E Sales Promotion Mgr., demonstrates Air Interrupters in a complete cubicle installation.

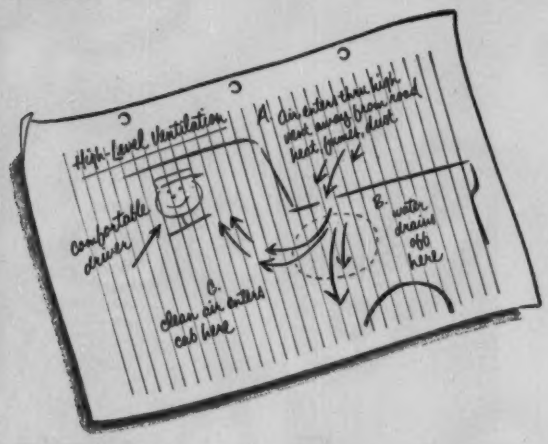
Write for Bulletin 152

3E Air Interrupter Switches are made in ratings up to 15 K.V.

ELECTRICAL ENGINEERS EQUIPMENT CO. Melrose Park, Illinois

Representatives in principal cities—in Canada by Power-Lite Devices, Ltd.

in a Chevy cab, even the air is better!


High-Level Ventilation
Air enters thru high-vent, away from road heat, fumes, dust
Comfortable driver
Clean air enters cab here
Water drains off here

...more evidence that Chevrolet Task•Force Trucks are engineered better and built better for bigger savings!

These cab features give you extra comfort and safety behind the wheel, extra savings on truck maintenance. And they're proof that the most modern trucks for your money are Chevrolets!

The drawing "doodled" above shows how Chevy's High-Level ventilation provides a *comfortable* interior . . . and the numbers in the big picture point out other advantages equally as good to have around you when you haul! They include:

(1) *A roof that's specially built for safer, more comfortable hauling.* Sturdy all-steel construction adds to safety; roof's unique inner reinforcement insulates the overhead against heat.

(2) *A gleaming, durable baked enamel outside finish.* Here's the reason your Chevy's exterior will resist wear better, look like new longer! This handsome finish is available in a wide variety of colors.

(3) *A Nu-Flex seat that beats the bumps!* Deep-comfort coil springs, metered air shock damping and 3-way adjustment let you take it easy on tough jobs!

(4) *A cab that's rustproofed to last!* Doors and similar surfaces are rustproofed on the inside as well as on the outside by immersion.

(5) *Concealed Safety Steps for convenience.* Inside each cab door, they give you firmer footing, make entering or leaving the cab easier and safer.

(6) *An undercoated floor, cowl side panels and fender flanges.* Virtually all exposed surfaces on the underside of the cab are protected by an anti-rust coating.

(7) *A non-glare instrument panel to make driving safer!* The textured finish on upper portion of Chevy's instrument panel reduces blinding sun reflections, minimizes eyestrain.

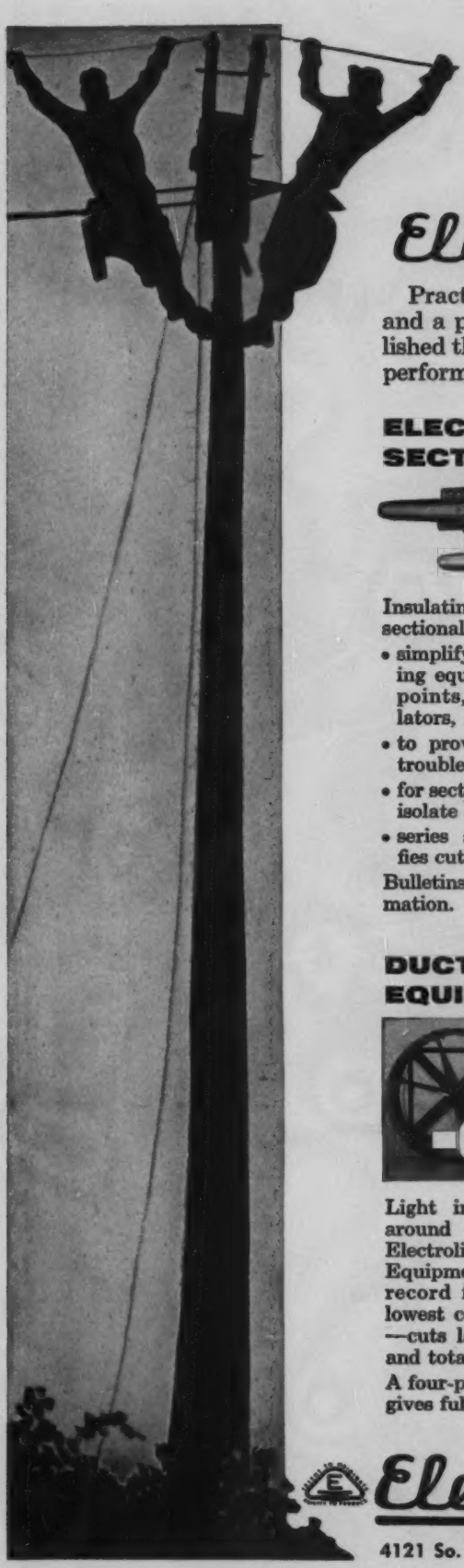
(8) *A reliable 2-speed electric windshield wiper* on each side.* Powered by electricity, their action remains *constant* under all conditions.

Such advantages as these (we've shown only a few) combine to make *everything* better in a 1957 Chevrolet truck! You'll see for yourself when you visit your Chevrolet dealer's. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

**Standard in Series 5-6-7-8-9-10000 models.*

...biggest sellers because they're the biggest savers! CHEVROLET

CHEVROLET TASK·FORCE 57 TRUCKS

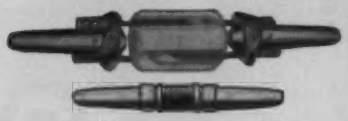


for the largest number of line applications, at the lowest possible cost . . .

Electroline Products

Practical experience designed these Electroline Products; and a practical habit of keeping close tab on costs has established them as first in the field—for top quality and economical performance.

ELECTROLINE SECTIONALIZERS

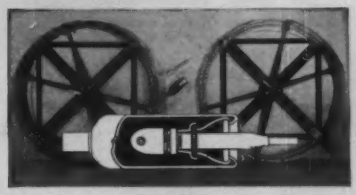


Insulating automatic line splice sectionalizers:

- simplify cutting-in of regulating equipment—disconnecting points, fuses, voltage regulators, series capacitors, etc.
- to provide points to test for trouble
- for sectionalizing networks—to isolate and test area in trouble
- series street lighting—simplifies cutting-in series lamps

Bulletins contain complete information.

DUCT-RODDING EQUIPMENT



Light in weight, feeds easily around bends, easy to handle. Electroline Steel Duct-Rodding Equipment has an extraordinary record for high efficiency at lowest cost. A big money-saver—cuts labor cost, original cost and total investment.

A four-page illustrated brochure gives full information.

AUTOMATIC LINE SPLICES

It is well said of these simple, rugged units—"They go on in no time; they hang on for all time." Easy to install—and their mechanical strength exceeds the rated breaking strength of the conductors. Ideal for restoring service.

AUTOMATIC DEAD-ENDS

In a typical "torture" test for strength, gripping and vibration damping features, 100,125,000 recorded vibrations did not develop any sign of failure of conductor in these rugged dependable Dead-Ends. Engineers call it equivalent to 50 years of ordinary service.

Electroline Service-Drop Automatic Dead End. The "3800" Series for holding pre-assembled service cable using a bare neutral conductor as the messenger.

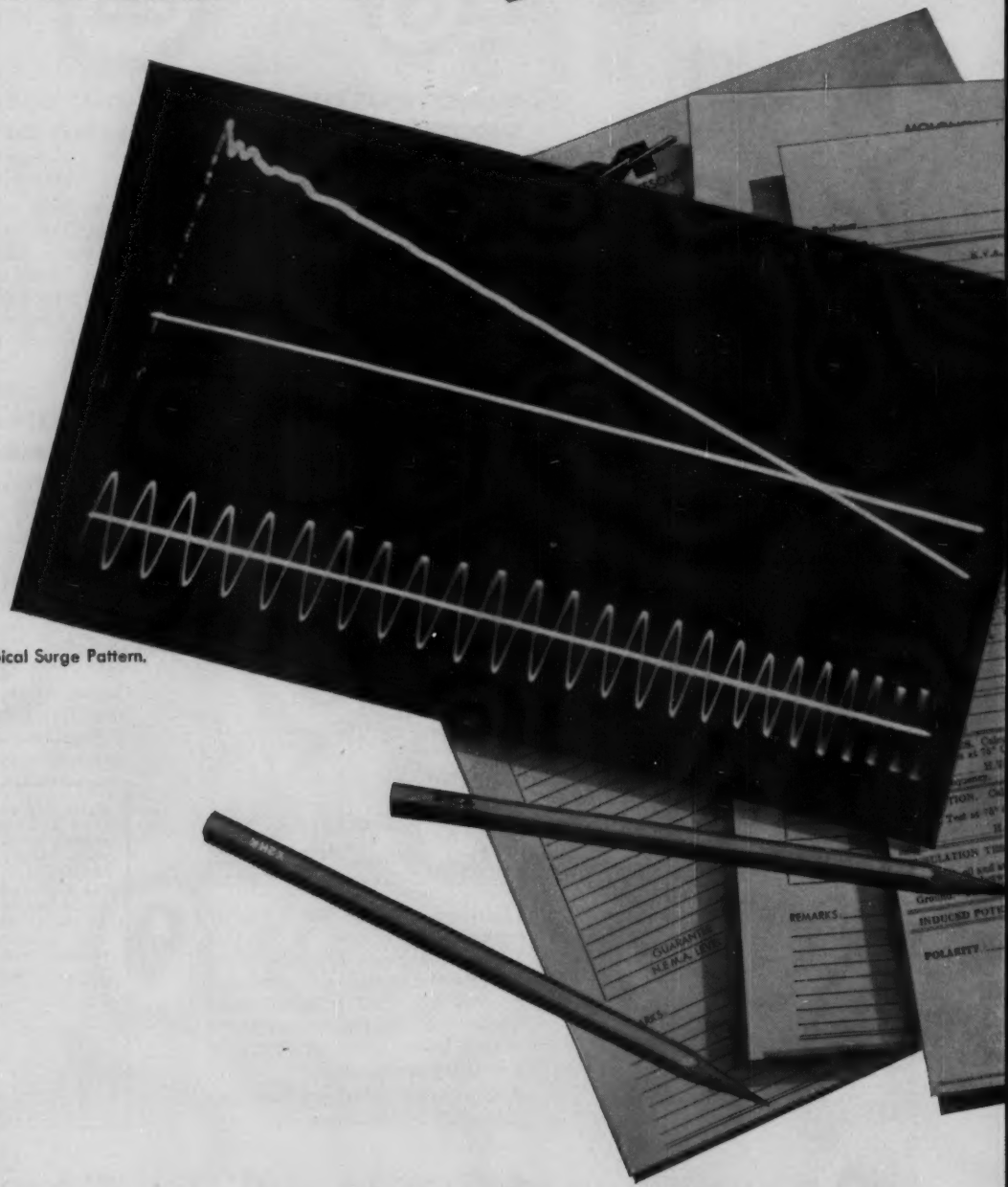
The method of gripping the bare neutral employed by this ELECTROLINE Anchorage eliminates the danger of short circuiting the phase wires so common with the use of concentric cable clamps.

ELECTROLINE Service-Drop Anchor Bracket. The "4000" Series for securely supporting the cable at any angle.

Electroline Company

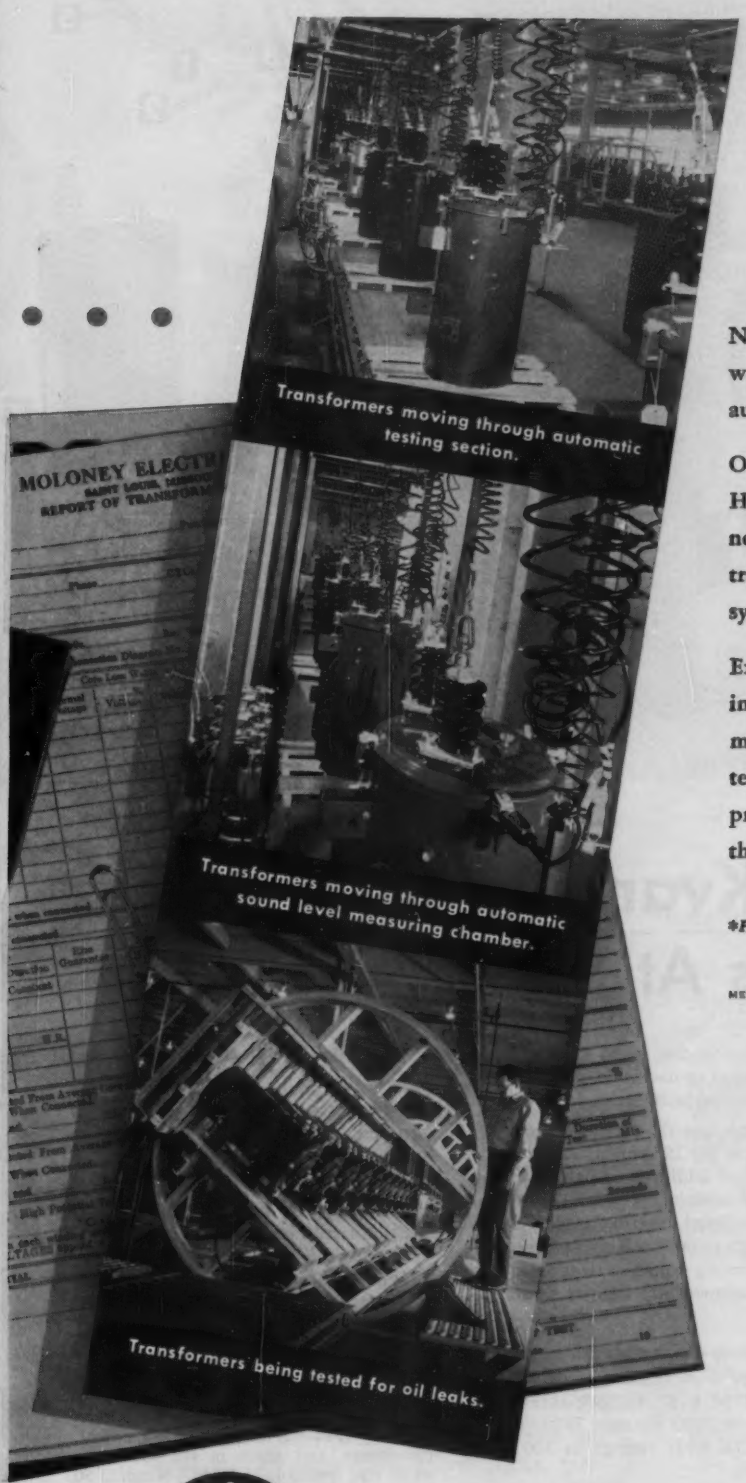
4121 So. LaSalle St., Chicago 9, Ill. *In Canada:* POWERLITE DEVICES, LTD., TORONTO

CERTIFICATE OF QUALITY . . .



Typical Surge Pattern.

MOLONEY ELECTRIC COMPANY


MOLONEY ELECTR
REPORT OF TRANSFORM
Transformers moving through automatic testing section.
Transformers moving through automatic sound level measuring chamber.
Transformers being tested for oil leaks.

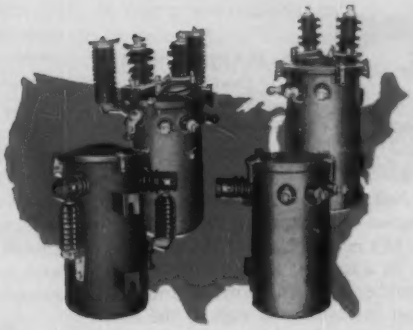
Now each Moloney HyperCore Transformer writes its own certificate of quality . . . automatically . . . before it leaves our hands.

Our new, enlarged production facilities for HyperCore Distribution Transformers are now in operation to produce more transformers individually test-proved for your system, in Moloney's Automatic Test Area*.

Experience since 1896, the latest techniques in engineering and design, modern manufacturing methods and *automatic* test facilities insure Moloney's continued production of quality transformers in the quantities and ratings you need.

**Patent Applied For*

ME57-8

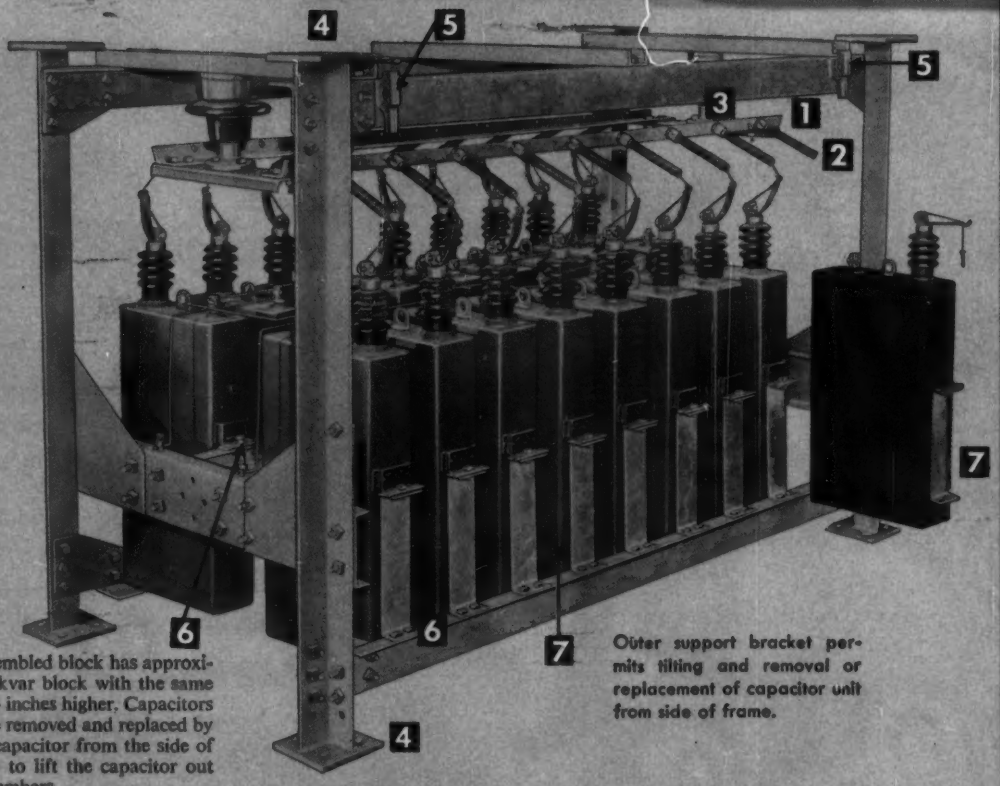


HyperCore Transformers are available from stock in all standard ratings in both Conventional and CSP designs.

MOLONEY ELECTRIC

Manufacturers of Transformers for Utilities, Industry, and Electronic Applications

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA


1 Aluminum-alloy bus
2 Bus-mounted fuses
3 Bus connections wire brushed and treated with oxidation inhibitor.
4 Jig-assembled for perfect alignment of mounting pad bolt holes.
5 Lifting lugs.
6 Tapped holes in frame for capacitor mounting bolts. Nuts not needed.
7 Outer support bracket permits tilting and removal or replacement of capacitor unit from side of frame.

L-M's new 50 kvar factory-assembled block has approximately the same area as a 25 kvar block with the same number of units and it is only 5 inches higher. Capacitors in L-M's 50 kvar blocks can be removed and replaced by simply tilting and sliding the capacitor from the side of the block. It is not necessary to lift the capacitor out from between the mounting members.

Another L-M First...

L-M's New 50 Kvar Capacitor Blocks Provide Kilovars At Still Lower Costs

By **BLAINE SCHULTZ**
Chief Engineer
Capacitors and Regulators
Line Material Industries

Only half as many units are required in substation capacitor banks when you use L-M's new blocks of 50 kvar capacitors. In addition, these blocks reduce the number of fuses, footings, and base support insulators, as well as the construction man-hours required for any given-size bank. L-M 50 kvar preassembled capacitor blocks also cost less and require about 50% of the substation area per kvar in comparison with blocks containing 25 kvar capacitors.

Capacitor Unit

The internal construction of L-M's 50 kvar capacitor is identical with that of the 25 kvar unit except for the length of pack. There is no increase in voltage stress to get the higher kvar rating. The new design is the result of continued improvement in dielectric materials and manufacturing techniques.

The tank has the same width, same thickness as the 25 kvar capacitor. Only 10 inches of additional height give you twice the capacity. It also has aluminum-metallized coating under alkyd resin paint; paragroove clamp-type terminals; strong solder-sealed bushings; and low-temperature Elemex liquid dielectric.

Factory-Assembled Blocks

L-M offers a complete line of NEMA Standard 50 kvar factory-assembled blocks from 2400 through 7960 volts—400 to 1200 kvar ratings in 100 kvar increments.

Outstanding features of L-M factory-assembled blocks include:

- Aluminum-alloy bus which is not subject to cold flow.
- Bus-mounted capacitor fuses with stainless-steel flipper to eject the leader if fuse link ever blows. Leader cannot hit live parts.
- Connections to the bus are wire brushed, and treated with oxidation inhibitor.
- Height of block is increased only 5 inches, because it is so designed that capacitors can be installed and removed from the *side*. It is not necessary to provide clearance to lift the capacitor out from between the mounting members.
- Heavy galvanized frame is jig-assembled for perfect alignment of mounting-pad bolt holes.

Prompt Delivery Now

You can save on the cost of equipment, man-hours, and space in the substation when you specify L-M NEMA-standard 50 kvar capacitor equipments. Prompt delivery . . . on all sizes and voltage ratings. Ask your L-M Field Engineer for complete information on L-M's new 50 kvar factory-assembled capacitor equipments. Or write Line Material Industries, Milwaukee 1, Wisconsin.

McGRAW EDISON

296-AR

LINE MATERIAL Industries *Elemex*® **Capacitors**

McGRAW-EDISON COMPANY

EDITORIALS

Steps Toward A Sound National Water Policy

"The single, fundamental principle of a sound national water policy must be that it meets the needs of the American people. We have not always adhered to this principle and have been the poorer for it. But the challenge of the future makes it imperative that our water policies be related to our needs, today and for the future."

These opening words of confession and dedication mark the spirit of conciliation that distinguishes the report on National Water Policy recently referred for action to the directors of the Engineers Joint Council.

The report, contained in this issue (page 69), reviews and restates the "Principles of a Sound National Water Policy" first published in 1951 by the Engineers Joint Council. In drafting this report the authors have recognized that, since 1950, water policy has been studied by numerous governmental agencies and others; that bills bearing on water policy have been introduced in Congress, and, that continued activity in water resource development has provided additional experience.

In weighing this new fund of fact and opinion opposing views of the functions of the federal government in the control and development of water resources have been brought closer together. A spirit of conciliation and a readiness to clarify divergent views is discernible even in the dissenting opinions appended to some of the recommendations contained in the report.

Certainly, this report, through the very acts of re-evaluation and restatement of principles of National Water Policy contributes to a clearer understanding of the basic issues involved.

Another and perhaps the most notable aspect of the report is the makeup of the EJC National Water Policy Panel that drafted it. This panel includes nine men, among them many who are distinguished and well-informed in the fields of power and water policy. These men deserve much credit for the long hours of work spent in drafting this report. The Engineers Joint Council should be complimented also for guiding this effort, dedicated as it is to the needs of the American people.

Let's Call It By The Right Name!

We have nothing against the proper use of abbreviations. As editors we find them highly useful instruments of language. But today the urge to abbreviate seems to be getting out of hand.

Specifically we find very little excuse today for anyone in the electrical industry to neutralize the effectiveness of the slogan "Live Better—Electrically" by shortening it to LBE.

A great deal of time, thought, and effort goes into planning and execution of an industry-wide program built around these three words and the concept of a way of life that they express. Seldom has this industry had a better slogan to epitomize its aims. Yet in our speeches, in our conversations, and in our written communications we daily discount our best promotional efforts through senseless abbreviation. We would as soon expect the clergy to refer to the Ten Commandments as TTC!

So let's stop standing in our own light. LBE is a pointless vulgarization of a great and growing concept of progress. We believe in it, let's call it by the right name; Live Better—Electrically.

A Film That Fights Fatalities

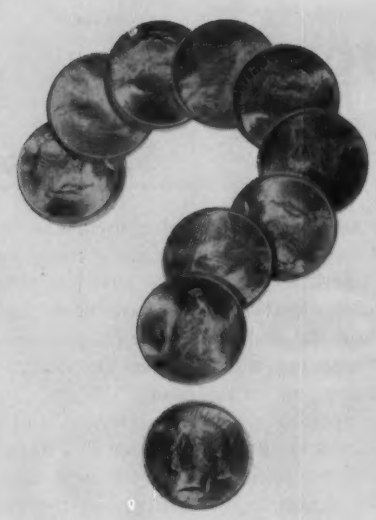
The equivalent of 192 six-man line crews has been wiped out by electric shock and burns, falls, or other on-the-job accidents. Merely pointing out that these fatalities were spread over a period of 10 years does not lessen the tragedy of this waste.

To reduce this toll is the constant battle of the Accident Prevention Committee of the Edison Electric Institute. One of the newest tools in the committee's educational campaign is a 35-mm sound motion picture in color. It's entitled "The Death of a Lineman."

Dramatic and realistic without resorting to sensationalism this film will get the close attention from all line crews given an opportunity to view it.

It is management's responsibility to make absolutely certain that all line crews are given an opportunity to view the film. The lives it saves will be their own!

How Are Money Rates Holding



Are utility money costs holding the line? The answer is "Yes."

Following the sharp rise in interest rates on funded debt to new peaks in early January, bond prices rebounded and yields dropped.

This trend continued throughout February with bond yields reaching a bottom around the first part of March. Since then they have remained fairly constant, still on an extremely high plateau in terms of financial history of the past decade, but measurably improved from the depths of early this year.

Interest Rates Are Holding

It looks now as though long-term interest rates will continue to hold in the near future. Perhaps by summer some further improvement will be reflected from the issuer's standpoint.

A few of the significant indications of improvement in bond yields over the past 75 days are:

1. A review of January's financing (EW, Feb. 18, p 67), shows four "AA" rated electric utility debt issues were offered at an average yield of 4.36%. The table on the opposite page shows four such similarly rated issues in February (none for March) offered at an average yield of 4.32%.

In the category of "A" rated electric utility debt, the story is somewhat the same. An average yield of 4.62% applied to the issues offered in January; 4.45% for a single issue in February and an average of 4.53% in March. This indicates that long-term utility debt rates have been at least holding their own or even edging down slightly.

2. A comparison of yields based on bid prices at April 2 for new issues, listed in the table on the opposite page, shows that two-thirds of these issues reflect a yield on April 2 below that on which they were originally offered.

This trend is confirmed by reference to a tabulation of 14 recent issues of utility funded debt contained in the "Wall Street Journal" as of March 28. It shows that the average yield based on the then bid prices of these issues was about 3½ decimals (0.035% per annum) lower than the average yield based on offering prices. Also 11 of these 14 issues showed lower yields at March 28 than at the offering date.

3. An important straw showing the balmier wind that has recently been blowing toward utility interest rates is the fact that the recent American Telephone & Telegraph Co "AA" rated "straight" debenture issue of $250 million was priced to yield 4.3%. While this was the highest yield on that company's nonconvertible obligations in several decades, it nevertheless compared favorably with the New England Telephone & Telegraph Co (AT&T subsidiary) yield of 4.65% on its similarly rated debentures offered in January when rates were scraping the ceiling.

4. Turning to the short term money market, some softening of interest rates has recently been realized. For example, after selling in the 3.25% range, U. S. Treasury bills are now down to a yield in the neighborhood of 3%.

Let's next consider future prospects as to interest rates on electric utility funded debt issues. Supply and demand with respect to funded debt issues of all categories will no doubt continue to constitute a key factor in yield trends.

It is estimated that total funded debt offerings for all corporations during 1957 will be about 4% (or $300 million) above similar 1956 offerings. This indicates an increase in such offerings by both utilities and industrial corporations.

To take care of this increased demand, it is estimated that there will be an aggregate increase in individual savings of $10 billion in 1957 over 1956. But only a relatively small part of this amount can be expected to be channeled into new corporate securities.

Progressively increasing pension trust accumulations should be a helpful factor in meeting corporate funded debt requirements.

New Home Starts Shrink

New unit starts for home construction is expected to shrink to 800,000-900,000 in 1957 as compared with 1.1 million in 1956. If 850,000 new units are used as an average, estimated indicated reduction in home mortgage financing should be in the neighborhood of $2 billion.

A substantial part of this would normally apply to insurance companies and other institutions which constitute the principal markets for corporate debt securities. Release of this money for investment in corporate debt should be another help-

ful development toward meeting the increased demand for funds in that category.

Amounts of corporate funded debt offerings in the immediate future represent an important indicator as to the yield trends in the more immediate future.

In the February-March period utilities floated $600 million in funded debt of which half was for electric companies. Industrial and other corporations sold $287 million in debt, making a total of $887 million for all corporations.

Future Financing Heavy

In April and May utilities are expected to raise $365 million in debt of which $167 million will be electric. Industrial and other corporations are expected to float $336 million. This will make a total of $701 million in funded debt floatations for these two months as compared with $887 million in the previous two months.

Offerings of preferred stocks of electric companies have been relatively sparse since Jan. 1. It may logically be anticipated that offering yields on preferred stocks will follow generally the trend of yields on new issues of debt of utilities.

Turning next to common stocks, we find that the aggregate offering price of these securities for electric utilities was over $46 million in January. This diminished to about $19 million in February. But in March the amount increased to about $71 million.

Excepting for one offering in January and one in March, amounting to about $11 million and $22 million, respectively, all these offerings (totalling some $135 million) comprised stockholder subscriptions. This indicates that with the large amounts of equity securities being offered most managements feel best results can be obtained by an appeal to their stockholders.

Common Issues Going Well

Despite the unusually large amounts of utility common equities offered in March, the market readily absorbed the new stock. This confirms the strong and persistent demand for electric utility equities, particularly at reasonable discounts from market such as have applied to stockholder subscription offerings.

While aggregate net income of privately-owned utilities declined a fraction of 1% in January, 1957 as against the year before, most electric utility companies continue to show improved earnings for comparative 12 months periods.

In view of this earnings trend, periodic dividend increases may be expected, and where this occurs, enhanced market values can be anticipated. Unless there is a wide break in the general market, utility stock averages, and particularly those stocks with improved earnings and dividends, seem destined to continue a slow but sure upward tendency in the market.

Do Equity Financing Now

All this adds up to the desirability of taking advantage of these relatively favorable market conditions to do common stock equity financing which may appear either necessary or wise within the balance of 1957 or even further ahead.

Delay in offering additional common stock equity in the hope of better markets would seem justified only when earnings are, for special reasons, definitely expected to show marked improvement in the future.

As to policy for financing with long term debt, there seems to be nothing in the present situation to indicate that electric utility management should either press or defer normal schedules of offerings. Mild expectations of lessening interest rates on utility funded debt by next summer don't seem definite or substantial enough to warrant delay in normal offering procedure.

An adverse factor contributing to the interest rate debacle of early January, 1957, was the scheduling of too many issues within a short time. This created fear of temporary oversupply among underwriting firms, causing them to raise the yields at which they were willing to bid for the new securities.

During May there appears to be three weeks in which three offerings of utility funded debt securities are scheduled within two or three days. The amounts of the offerings in these short periods aggregate about $53 million in one case; about $30 million in another, and $120 million in the third. You should keep an eye on the future financing schedule.

Yields of Recent Electric Security Issues

(FEBRUARY–MARCH 1957)

Company	Issue	Moody's Rating	Principal Amount (Millions)	Offering Date	Yield on Offering Price	Yield on Price of 4/2
Commonwealth Edison	4¼s 1987	AAA	$50	3/13	4.25%	4.22%
Public Service of Okla	4¼s 1987	AA	12	2/5	4.295	4.22
New England Power	4⅜s 1987	AA	10	2/19	4.255	4.27
Southern Indiana G&E	4⅜s 1987	AA	5	2/27	4.22	4.32
Consolidated Edison	4½s 1972(a)	AA	55	2/28	4.50	(b)
Potomac Electric Power	4⅝s 1982	A	30	2/14	4.45	4.47
Columbus & Southern Ohio	4½s 1987	A	16	3/6	4.41	4.45
Minnesota P&L	4¾s 1987	A	12	3/12	4.58	4.49
Hawaiian Electric	4.7s 1987	A	7	3/20	4.70	(d)
Public Service E&G	4⅝s 1977(c)	A	50	3/21	4.52	4.47
Appalachian Electric Power	4⅝s 1987	A	29	3/21	4.55	4.42
New Orleans Public Service	4½s 1987	A	6	3/29	4.45	(d)
Central E&G	4⅞s 1971	BAA	1.75	2/20	5.00	(d)
PREFERRED STOCK						
Potomac Electric Power	300,000 sh $2.44	....	.....	2/27	4.88	....
COMMON STOCK	(shares)					
South Carolina E&G	336,000(e)	....	.....	2/27	$18.25	$21.25
West Penn Electric	528,000(e)	....	.....	2/27	24.50	27.00
Consumers Power	550,000(e)	....	.....	3/7	42.75	46.25
Central & South West	600,000	....	.....	3/13	36.75	36.625
Baltimore G&E	570,000(e)	....	.....	3/19	31.00	34.125
Colorado Central Power	74,000(e)	....	.....	3/19	22.50	23.50
Savannah Electric	163,000(e)	....	.....	3/19	18.00	19.00
Eastern Utilities Associates	89,000(e)	....	.....	3/21	30.50	35.75
Black Hills P&L	35,000(e)	....	.....	3/27	22.00	22.50

Notes—(a) Convertible debentures.
(b) Bid price not applicable due to operation of conversion privilege.
(c) Debentures.
(d) No quotations shown in National Quotation sheets for April 2.
(e) Offered for subscription to company's stockholders; shares are approximate.

Darkness follows an ominous funnel as . . .

Tornado Runs Up a $60,000 Bill for DP&L

Snapping power lines and toppling poles followed in the wake of the tornado which plowed a 21-mile path through residential and industrial sections of Dallas, Tex., recently.

The storm left 10 dead, at least 185 injured, 500 homeless, and more than $4 million in damages. More than 800 homes and businesses were demolished or damaged, leaving streets badly clogged with debris.

Dallas Power & Light Co officials said generally the area along the path of the storm was darkened. At the peak of the tornado, about 75,000 homes were without service, but company officials said all but about 3,000 of these had power restored within four hours after the tornado had passed.

About 650 poles were damaged, 150 of them snapped like matchsticks and hurled through the air by the force of the storm.

DP&L put 99 trucks, 205 linesmen, 18 troubleshooters, 8 dispatchers, and 15 sub-dispatchers into service to rush restoration work on an around-the-clock basis.

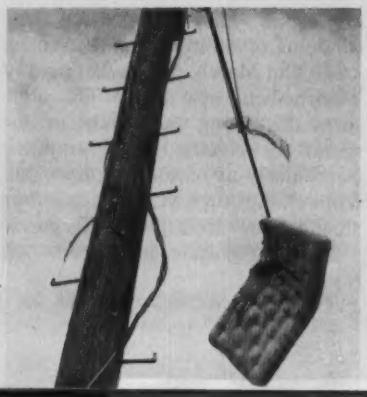
Assistant Commercial Manager T. C. Winter said one of DP&L's first big jobs was to restore service to flood pumps along the west levee of the Trinity River near downtown Dallas. This was done by early Wednesday. Electrical service was back to normal in all areas of the city by late Friday.

Cost of the storm to DP&L is estimated at $60,000 to $70,000.

Texas Power & Light Co, which operates in areas buffeted by high winds which accompanied and followed the tornado, reported only minor damage to equipment and few interruptions of service.

ROOF, TREES, AND WIRES lie in a tangled mass in front of house owned by W. N. Stovall. Stovall said tornado rumbled like a freight train as it swept in

FLYING MATTRESS, blown from a house, was speared in flight by street light



Report Urges AEC's Reorganization

Commission's civilian and military functions should be separated, says Joint Committee on Atomic Energy. Three schemes are proposed—all posing problems

The civilian atom industry is growing so fast that the present regulatory machinery of the Atomic Energy Commission will be changed to separate civilian regulation from production of atom materials and bomb building.

Some such change has been talked of for some time. But smoldering Congressional discontent with the way in which AEC has handled recent licensing and regulatory functions was brought to a head last week in a special report by the Joint Committee on Atomic Energy on ways of reorganizing AEC.

Reorganization Called a 'Must'

The language of the 200-page report is inescapable even though it contains no specific legislative recommendations: Reorganization of AEC is a must. Immediately, it might take the form of reorganizing the existing divisions of AEC to separate those in charge of civilian matters more completely from the other commission activities.

Washington experts believe, however, that a completely separate agency will be established eventually to license and regulate the civilian aspects of atomic energy.

AEC, and presumably the Administration, is opposed to a completely separate agency. But AEC Chairman Lewis L. Strauss has acknowledged the need for some change and has told JCAE he is studying some type of internal separation of licensing functions.

AEC has attempted in recent months to meet some of the criticism of its licensing operations. It has announced the availability of public hearings on all reactor projects and it publishes hazards evaluations on every reactor.

The question of separating AEC's quasi-judicial proceedings from its promotional (encouraging reactor construction) and developmental and research activities came to a boil last summer when AEC issued a construction permit to Power Reactor Development Co for its Monroe, Mich., fast breeder reactor project.

Critics, notably Sen Clinton Anderson, (D-N.M.), and Rep Chet Holifield (D-Calif.), argued that in its haste to encourage private development of atomic power AEC had issued a permit for a project that had not been proved safe. Thus its promotional and regulatory functions were in conflict. Other issues developing from the case were the need for publishing hazards evaluations of reactor projects and holding public hearings on such projects.

Three Plans Proposed

The possibilities for reorganization fall into three categories.

At one end of the scale would be a completely separate agency to regulate private atomic activity. At the other end would be the present 5-member commission—but to allocate more sharply regulatory responsibility to one or more separate units in AEC and to make these units more self-sufficient and more removed from other activities.

The middle course would be internal reorganization of AEC to create a separate regulatory body within the commission, perhaps under one or more commissioners.

The study finds there are problems involved in all courses, problems special to atomic energy.

Duplication Cited

The existence of similar private and government atomic power development programs accentuates the problem of duplication and separation of function.

A separate agency would require a staff of technical and other personnel engaged in activities very similar to those of their counterparts in the government program.

The report makes these comments on the three possibilities:

Separate Agency—This could be achieved by reducing the present number of commissioners from 5 to 3 and creating a separate commission of 3 members.

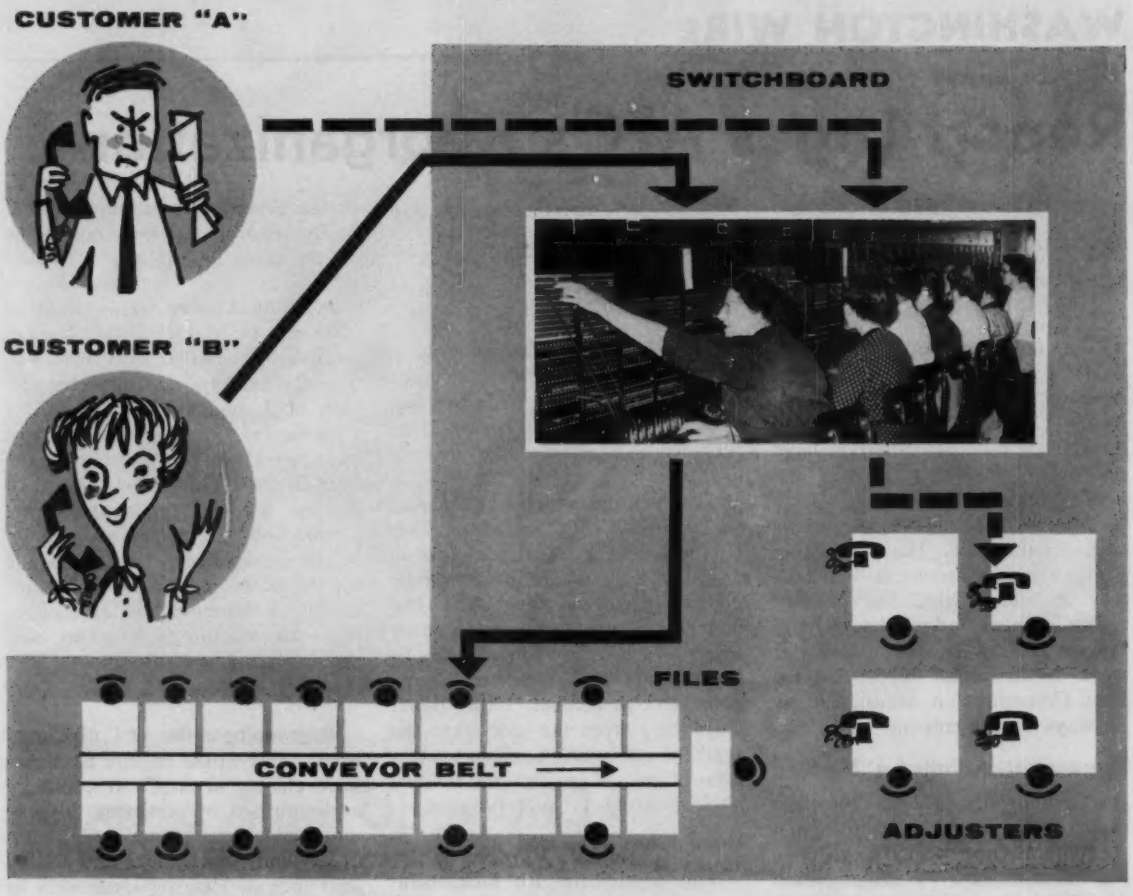
It need not have a large staff nor large workload as indicated by the Federal Coal Mine Safety Board of Review. It would regulate the private atomic energy industry while AEC would continue to be responsible for the main operating program, including procurement of raw materials, manufacture of weapons, and the research and developmental programs.

Regrouping at the AEC divisional level—This would require no structural change in AEC. It could be accomplished by removing all promotional activities from the Division of Civilian Applications and adding an Office of Hearing Examiners to develop a group qualified in this field.

To achieve objectivity in evaluation of reactor safety, the present hazards evaluation staff of the Division of Civilian Applications should be elevated to divisional status.

Agency within AEC—This could be achieved by establishing a Licensing Board at the level of an assistant general manager to consist of three members who would be recognized experts in atomic energy development and reactor safety. They would be appointed by the President subject to senatorial consent. They would have final authority in licensing cases.

The report finds, though, that in the long-range view the arguments favor a separate agency independent of the government's manufacturing, producing, and operation efforts in the atomic energy program. Such an agency would be "likely to maximize objectivity and impartiality both in evaluating reactor safety and making decisions on competing applications."



Don't Keep the Customer Waiting

Union Electric inaugurates "one stop" service for its customers' telephone calls. Now it's possible to direct calls promptly, handle them efficiently at the special customer service center

Customers are finding it easier and more pleasant to get their telephone messages across at Union Electric Co. They just tell the Union Electric switchboard operator the nature of their call and—click—they have their party on the line. In nine cases out of ten they can transact their business—be it a bill complaint, a service request, or a commendation for some outstanding service—with just one telephone stop.

John C. Faris, who heads Union Electric's Customer Business Department and directs the telephone operation, calls the new, streamlined procedure for handling calls "One-spot, one-stop customer service." He says it has greatly reduced the number of misdirected customers' calls that caused delay and irritation under the previous system. Or to put it another way, the customer no longer has to go on a telephone "merry-go-round" before he finally finds the person he needs to handle his call.

If the call happens to be a request for a change of service or additional service, the switchboard operator directs the call to a telephone service clerk who takes the order, checks it against existing service records, and sends it along a conveyor belt to be filled.

If it happens to be a bill complaint, the call is immediately directed to one of the senior adjusters. The adjuster, in turn, has telephonic access to all other departments. He can, while holding a customer on the line, get the information he needs to handle and complete the call.

But Union Electric's "one-stop" service took a lot of thinking and a lot of planning. The schematic diagram at the top of the page helps point up some of the highlights of the one-stop procedure. Here briefly is a step-by-step description of how the utility's new "one-stop" system works:

1. Union Electric has a special "customer service" listing in the St. Louis telephone directory. This is separate from its listing for other

business calls. Thus, the customer plays a part in helping direct his call to the appropriate person. He dials the "customer service" number.

2. The call comes in on one of the 27 incoming trunks on the "customer" side of the utility's central switchboard. This side of the switchboard (shown in photograph in diagram, left) has four positions and may be manned by as many as four operators. On the other side of this board, there are four positions for handling non-customer calls. The central position on the board makes it possible for an operator to switch any misdirected calls from one side of the board to the other.

3. If the call is a simple service call, the switchboard operator directs it to one of the battery of telephone service clerks located in an adjoining file room. There a clerk, wearing a telephone head set, takes the order. While the caller is still on the phone, the clerk checks the order against the customer's file card to make sure it is correct. The call completed, the order is then put on a conveyor belt that runs the length of the file room and goes to a central desk for proper dispatching.

4. If the call is more complicated —such as a bill complaint—the switchboard operator directs the call to one of the group of "adjusters" also located in a nearby room. As shown in the illustration, the adjuster is seated at a separate desk equipped with a telephone which has a hold button. Thus the adjuster may take the call, contact the file room or other company departments for information, and complete the call within a very few minutes and without the need for a call-back to the customer.

System Benefits Operators

Besides its contribution to customer convenience and satisfaction, the one-stop procedure has also proved a real boon to Union-Electric's switchboard operators who must handle some 1½ million incoming calls a year. Formerly all types of incoming telephone calls were received on all the switchboard positions. The general offices had a single listing. Besides the great volume of general business calls received daily and dispatched to several hundred stations throughout the company offices and plants, the operators also had to identify and screen all of the many kinds of customer calls.

Operators not only were required to know from memory what company personnel could be reached at each telephone station, but they also had the task of finding out just what each customer wanted to know so those calls could be placed accurately. Even the most experienced operators occasionally misdirected some calls under these circumstances, resulting in call-backs and delays which often proved irritating to the customer.

Result of Extensive Study

The "one-stop" service procedure was instituted at Union Electric following extensive study of customer operations in several larger utilities. As may be gathered from the step-by-step description, the procedure was predicated on two basic recommendations: (1) That incoming customer calls be separated from other business calls at the initial point of contact—the switchboard. (2) That all possible functions required to dispose of incoming customer calls be centralized.

This centralized customer service group also takes emergency calls—either trouble or "lights out" calls—from customers. These are recorded by the telephone clerks and passed immediately to the area dispatcher. A service man is on his way to the customer within a matter of minutes after the call is taken. The telephone business office personnel can be mobilized for off-hours duty as requested by the Trouble Department. During the December sleet storm when some 100,000 Union Electric customers were deprived of service, the telephone personnel were mobilized. From 4 PM Saturday to 8 AM the following Monday, they handled 18,000 individual customer calls—passing the information on to the 700 linemen, troublemen, testers, and dispatchers to help them restore the service.

Modern Way of Business

Commenting on the "one-stop" service procedure, Union Electric's customer-service expert John Faris had this to say:

"People nowadays can conduct practically every type of business with a utility by telephone, except paying their bills—and they can do that by mail. In order to keep up with the tempo of everyday living, utility companies must gear their operations accordingly, particularly where the customer is directly involved. What the customers think of us is what the public thinks of us. Our customers are the public, because everybody uses our service. No matter what our general public relations program may be, it behooves us to take care of every type of business transaction as quickly, as courteously and as efficiently as possible. We are convinced that our one-stop service installation in St. Louis is a long stride in that direction."

Safety Film to Dramatize Lineman's Electrocution

"The Death of a Lineman," a ten-minute 35-mm color slide film with sound, is to be published about April 15 for utilities to use in safety programs, reports Edison Electric Institute's Accident Prevention Committee.

The film depicts what appears to be a normal day for a line crew until a lineman accidentally is electrocuted. The film closes by pointing out that in ten years, 192 six-man line crews have been wiped out by shocks and burns, falls, and falling objects.

Princeton to Explore Fusion for Power

AEC to back basic experiments that may lead ultimately to power reactors employing the H-bomb principle

A step toward what may become a major breakthrough in nuclear power technology was taken early this month as Atomic Energy Commission approved plans for design and construction of a large experimental device at Princeton University's Forrestal Research Center.

Known as the "Model C Stellarator," the device will be used to explore possibilities of controlling the vast energy inherent in thermonuclear reactions—awesomely characterized by the H-bomb.

The Stellarator, a purely research device, further will extend Princeton scientists' exploration of controlled fusion which began in 1951. The device essentially consists of a hollow tube containing an ionized gas. External coils surround the tube, producing a magnetic flux that confines the gas.

Object of the research program is that of heating the gas to temperatures of millions of degrees while confining the gas in the tube long enough to enable fusion to take place, the AEC stated.

Construction of the supporting office and laboratory facilities will begin this summer. The device should be in operation late in 1960 or 1961, said AEC.

At his recent press conference, Adm Lewis L. Strauss, AEC chairman, said a controlled thermonuclear reaction is "no longer in the stage of wishful thinking." But industry observers believe presently planned fission plants will be amortized before fusion power is a reality.

LEWIS L. STRAUSS, at recent news conference, referred to a thermonuclear research device pictured behind him. It is used at AEC's Los Alamos, N. M., scientific laboratory

If man can control fusion reaction, Strauss said, he could use deuterium—plentiful in the ocean—as a fuel. Total fusion of 2.2 lb of deuterium would produce about 100 million kwhr, and would require only an estimated 10,000 kwhr to make.

How Much Will Reactor Liability Insurance Cost?*

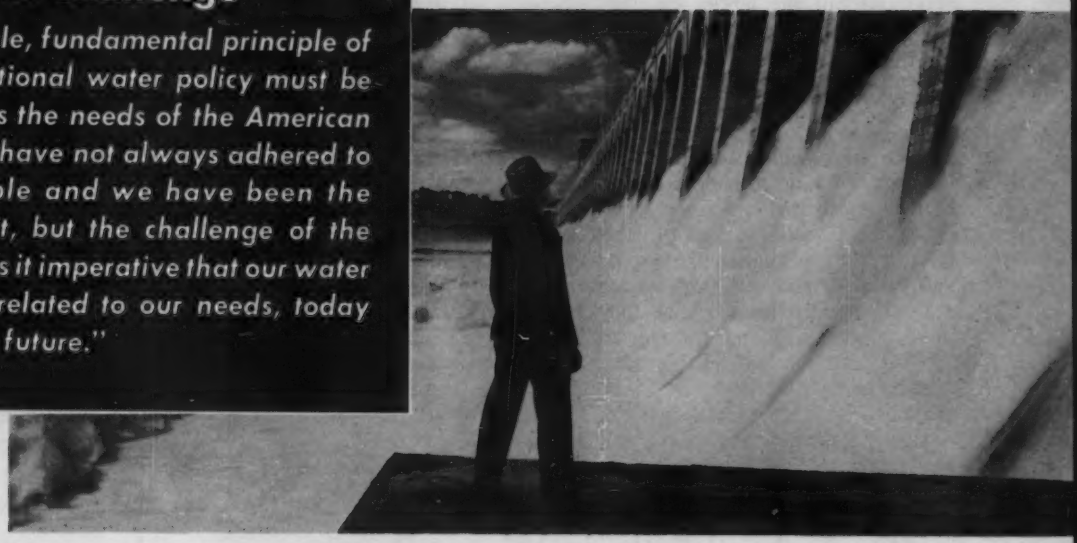
Amount of insurance (millions $)	Boiling water type power reactor, 600 Mw of heat—fully contained —located in high value agricultural area: Annual premium per million (thousands $)	Total annual premium (thousands $)	Pressurized water type power reactor, 480 Mw of heat—fully contained —located in sparsely populated rural area: Annual premium per million (thousands $)	Total annual premium (thousands $)
First 1.0	40.0	40.0	20.0	20.0
Next 4.0	20.0	80.0	10.0	40.0
Next 5.0	8.0	40.0	4.0	20.0
Next 10.0	4.0	40.0	2.0	20.0
Next 20.0	2.0	40.0	....	....
Over 20.0	....	....	1.0	....
Over 40.0	1.0	....	....	....
Annual premium for $50 million of insurance	....	250.0		130.0

* Figures based on tentative premiums submitted to the Joint Committee on Atomic Energy by C. L. Haugh, Travelers Indemnity Co, on behalf of the Nuclear Energy Liability Insurance Association. Five major factors are considered in determining premiums: size, type, use, location, and degree of containment of the reactor.

Total coverage that the private insurance industry is willing to underwrite is $60 million—about $50 million by a pool of casualty companies and about $10 million by a group of mutual companies.

The Challenge

"The single, fundamental principle of a sound national water policy must be that it meets the needs of the American people. We have not always adhered to this principle and we have been the poorer for it, but the challenge of the future makes it imperative that our water policies be related to our needs, today and for the future."



Engineers propose . . .

"A Sound National Water Policy"

Basic Principles

1 Subject to the principles of economic justification set out later herein, plans for the development and use of water resources should provide for maximum utilization of these resources. The objectives of such resource development should include the safeguarding of our resources against deterioration from soil erosion, wasteful forest practices, and floods; the improvement and higher utilization of these resources to support an expanding economy and national security; assistance to regional development; expansion of all types of recreational opportunity to meet increasing needs; and protection of public health.

2 Consideration and control of the waters of the United States are in the national interest, but not necessarily a function of the Federal Government. On the contrary, that which can be done by the individual should be done by him and that which requires collective action, at the lowest governmental level practicable.

3 Beneficiaries of Federal water-resource projects should reimburse the Federal Government for their equitable shares of the costs.

4 Project reports should be clear and forthright, presenting all costs as accurately as possible, proposed reimbursement plans, and subsidies.

5 All projects within a river basin should, where practicable, be coordinated within the framework of a comprehensive, effective development plan.

6 There should be a Board of Review for the impartial analysis of all Federal water-resources projects.

7 All Federal agencies engaged in water-resource development should conform to the same basic policies.

Board of directors of the Engineers Joint Council meets next week to consider the report of its Review Board-National Water Policy Panel. On this and the following pages is a condensed version of the report. It brings up to date and supercedes the "Sound National Water Policy" statement issued by EJC in 1951. Panel members and major dissents, page 72.

Basic Concepts

• To assure the optimum contribution of the waters of the United States to economic growth and national welfare, development and control of those waters are essential. The participation of State, interstate, local, and private agencies in this development should be actively encouraged and expanded, with the Federal Government assuming responsibility within its Constitutional power and when its participation is necessary to serve the national interest.

• It is customary to consider water resources as renewable and therefore inexhaustible. But the physical sites at which these resources can be developed are limited in number. Planning must therefore be long-range if proper use of water resources is to be accomplished.

• The possible expenditures for water resource development are

enormous but the labor, material, and money available at any particular time for construction of such works are limited. It is important, therefore, to devote the available labor, material, and money to those projects which will make the maximum contribution of benefits rather than to those that are merely feasible. It is essential that all projects be geared to the national economy and carefully planned. Projects are not so urgently needed that they must be designed and constructed without adequate and reliable data.

• Reports on a project should be presented with the utmost integrity —clearly stating the short and long-range effects of the project and accurately summarizing the expected costs and benefits. Intangible or indirect benefits may influence the final decision, but, in any case, they should be presented against a scrupuluously accurate background of direct and tangible facts, and of intangible and indirect costs and losses.

• The planning of water-resource projects should fully recognize the roles of both surface and ground water in water supply and the importance of planning land-use jointly with water-use.

• Because there are now inconsistencies in national water policies; because the pertinent policies of various Federal agencies should be better coordinated; because there should be greater coordination of Federal and State functions, interests, authority, and rights; because the demands of water resource development, in terms of money, labor, and material, are of tremendous magnitude and because there is need for continued comprehensive development of water resources, there is definite need for a unified national water policy.

• It would be contrary to the nation's interests to force all water projects into a rigid and inflexible framework. A sound water-resource policy should embody some flexibility and adaptability of methods and purpose.

I. The Federal Role in Water Resource Development

It is recognized that the Federal Government has a significant role to play in the development of water resources. In its exercise of that role, the Federal Government should assume the initiative in development, if and when, (1) an economically justified project is of such magnitude as to be beyond the means of local groups, or (2) such a project is so complex that no clearly-defined local group or groups can be identified as principal beneficiaries, or (3) the participation of the Federal Government is necessary to assure the maximum development consonant with a comprehensive regional and basin plan. As to other projects, State, interstate, local, and private interests or agencies should be encouraged to undertake them, when consistent with a reasonable comprehensive plan. The development, ownership, operation, and maintenance of water-resource projects should be kept as close as possible to those who use and benefit from them. To that end, those groups should be permitted, on a fair and equitable basis, to acquire title to and to operate and maintain projects constructed by the Federal Government.

Economic Justification

• The Federal Government should undertake projects only when they will increase the wealth of the nation. As a measure of the direct economic effects of a proposed project, the ratio of annual benefits or values to annual costs should be computed, using direct tangible benefits and costs expressed in monetary terms. Because without an excess of benefits over costs there can be no increase in the national wealth and because the national good requires construction of the best projects first, a benefit-cost ratio substantially greater than one should be required. If, however, intangible benefits are shown to be large and certain, authorization of an occasional project with a direct benefit-to-cost ratio less than one may be justified.

• The costs reported for a proposed Federal project should be detailed and thoroughly inclusive. All items of first cost, including cost of investigation, lands and rights-of-way, construction, interest during construction, and the cost of measures needed to correct detrimental results of the project, should be presented. The costs of all components of the project required to achieve its intended purpose, including costs to others than the Federal Government, should be included in the cost summary. The estimates of annual costs should include those for operation and maintenance, interest on the unamortized amount of first cost, proper allowance for taxes *(paid or foregone)*, amortization, replacements (to the extent required during the period of amortization), and allowance for insurance (or its equivalent) and contingencies. Costs to be borne by non-Federal participants should also be included in the cost summary. Estimates should be clearly indicated as such, and where of doubtful accuracy should include the maximum and minimum of the range of the cost estimates.

• In calculating the annual cost of the project, amortization should be assumed to take place within the useful life of the project or within a maximum of 50 years, whichever is less.

• The money rates used for calculation of project costs should cover all costs of securing money for the project.

• The expected benefits of water resource projects should be itemized in detail and expressed in average annual monetary terms. All direct benefits, including those to be received by non-Federal participants should be included in the appraisal of a project.

• Any expedient to give unsound projects the benefit of surplus values which may accrue from sound projects should be avoided. Basin accounts may be used when in accord with sound business practices.

Reimbursement

• The identifiable beneficiaries (both direct and indirect) of a Federal water resource project should reimburse the Federal Government fully for their shares of the project costs. No Federal project should be constructed until the identifiable beneficiaries have arranged to contribute an equitable portion of its cost.

The contribution may be in the form of land or rights-of-way, of payment for vendible products or services, or of taxes or assessments levied by State and/or local taxing authority.

• All income from Federal water resource projects should be paid into the general funds of the Federal treasury and be disbursed only pursuant to appropriations by Congress. Revolving funds for construction should be eliminated.

• Reports on multiple-purpose projects should show the allocation of cost between the several functions of the project and to the identifiable beneficiaries and the nation as a whole, as a basis, among other things, for judging the equity of proposed reimbursement schedules. The Board of Review should prescribe the methods to be used for cost allocation.

• Cost of operation and maintenance of completed projects should be borne by the beneficiaries of the project.

Planning

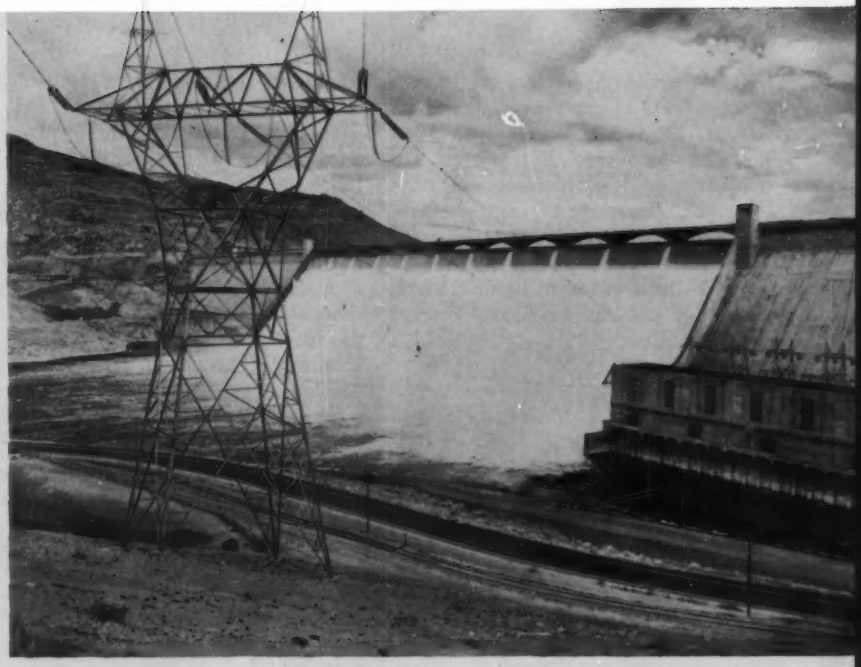
• Planning and implementation of all Federal water resource projects should be in strict conformity with basic Federal law and should fully recognize pertinent State laws and rights.

• Insofar as possible the principles governing the planning, evaluation, repayment, design, and operation of all Federal projects should be the same regardless of location, purpose, or constructing agency.

• The national interest demands that projects within a single river basin, whether they be Federal, State, private, or combinations of such interests, be coordinated to provide maximum effectiveness.

• The States should be encouraged to establish State water resource planning boards, or, by compact, interstate agencies to represent State and local interests in planning Federal water projects and, where appropriate, to plan for State and local participation in the actual development.

• Production of power for domestic and industrial use is the responsibility of local interests. The Federal Government should not undertake any water resource projects exclusively for power development except as required to serve Federal installations.



II. Production of Power

• The production of power at multiple-purpose projects in every case where it adds to the economic soundness of the project is justified and desirable, and maximum power production consistent with the primary purposes and economic soundness should be provided. But under no circumstances, other than to meet emergency needs of national defense, should such production be permitted to interfere with the efficient operation of the project for its intended primary purpose or purposes.

• Sale of Federal power should be at the generating station except where transmission is necessary for the Government's own use, for proper integration with other Federal power plants, or for the equitable disposal of the power.

• Power from Federal projects should be sold at the lowest possible rates consistent with sound business principles, provided that the actual annual power income from a project should be equal to the estimated annual power value upon which authorization of the project has been predicated, but not in excess of market value. The rates charged for power from a Federal project should properly reflect the annual costs actually incurred by the government (see paragraph 2 under Economic Justification). Power rates should not be burdened with costs properly chargeable to other purposes of the projects.

• When irrigation is one of the project purposes, Congress may reasonably appropriate the equivalent of surplus power revenues to subsidize any portion of the costs allocated to reclamation which is beyond the ability of the water users to repay. The total of annual costs of the project repaid directly or indirectly out of power revenues should not exceed the corresponding costs of the most economical alternative power project.

• The operation of Federal hydroelectric power plants should be integrated with other power production in the area, to the extent that this is practicable and can be done to mutual advantage without interfering with the intended primary purpose or purposes of the project.

• Local enterprise should be encouraged and given priority over the Federal government for development of power sites and for development of power at Federal multiple-purpose dams, providing such local development is subject to proper governmental control and is consistent with long-range, basin-wide plans.

• The existing provisions of law giving perference in the purchase of Federally generated power to public

bodies and cooperatives are inequitable. These provisions should be repealed and replaced with laws which encourage and protect cooperative arrangements between private, local, State, and Federal agencies which decrease the financial responsibility and control of the Federal government, but which do not prevent necessary Federal leadership.

Flood Control

Flood control reservoirs affording flood protection along a considerable portion of an interstate stream and flood control works which are part of an integrated flood control plan for a large stream, with major benefits to interstate commerce, may be constructed by the Federal Government. Such construction should be preceded by an agreement by the local interests or the States concerned to provide necessary land and easements; to repay the Federal Government an equitable portion of the cost in proportion to benefits received; and to pay an appropriate share of the cost of operation and maintenance of the project.

Reclamation

Lands awaiting reclamation are not deteriorating; they constitute a reserve for future needs. At the same time, substantial increases in production are possible at relatively low cost through supplemental irrigation and improved farming practices in humid areas and through rehabilitation of existing reclamation projects. Before Federal participation in a reclamation project is authorized or detailed planning is undertaken, there should be required a demonstration that the project is important to the national economy. The extent to which individual reservoirs are intergral parts of comprehensive basin plans serving other important purposes should also be taken into consideration. Federal participation in a reclamation project should be authorized only on the condition that the total Federal construction cost allocable to reclamation be repaid by project revenues.

Navigation

• The development of waterways for navigation should be planned as an integrated part of the overall transportation system of the country. Waterways should be developed only when they offer a significant improvement in transportation and real savings in transportation costs. Federal waterways costs should not be viewed as a yardstick for other transportation costs or charges or used as a means artificially to depress charges for transportation by other carriers.

• There should be legislation providing for equitable charges for the use of Federally-constructed waterways. This legislation should be formulated as a part of the whole problem of reconciling and making workable a coordinated transportation system which would serve the needs of an expanding economy.

Water Supply

Development of water supply for municipal and industrial use is the responsibility of local interests. The Federal Government should undertake no projects exclusively for municipal and industrial water supply, except to serve Federal installations. But all Federal projects should be coordinated with the plans of local interests, and facilities should be included to furnish the required water, provided the local interests finance the full cost allocated to water supply.

Recreation

Where feasible, local interests should be encouraged to develop the recreational aspects of Federal projects and to contribute a portion of the capital investment for recreation. The full cost of operation and maintenance of Federal recreational facilities should be recovered through admission and concession fees and/or State and local contributions.

The Committee Members

Richard Hoak, Panel Chairman, Senior Fellow, Mellon Institute of Industrial Research, University of Pittsburgh, Pittsburgh, Pa.

R. K. Linsley, Panel Secretary, Dept of Civil Engineering, Stanford University, Palo Alto, Calif.

M. J. Dowd, consulting engineer, Imperial Irrigation District, El Centro, Calif.

Louis R. Howson, consulting engineer, Chicago, Ill.

Herbert E. Hudson, State Water Survey, Urbana, Ill.

Abel Wolman, consulting engineer, professor of Sanitary Engineering, The Johns Hopkins University, Baltimore, Md.

R. G. Folsom, Engineering Research Institute, University of Michigan, Ann Arbor, Mich.

Philip Sporn, President, American Gas & Electric Co, New York, N. Y. Sporn registered two dissents to the report. The more important took issue with the proposed economic justification of projects, arguing that benefits must be net—that is after deducting all costs to beneficiaries.

Paul J. Raver, Manager, Seattle Department of Lighting, Seattle, Wash. Raver dissented on some 20 points made in the report. Among his specific dissents; he does not believe "taxes foregone" should be included in the cost of a project. He would not abolish construction revolving funds. He believes preference in marketing of power should be retained.

FRED G. AANDAHL, assistant Secretary of the Interior, tells civil defense plans. Others are Edwin Vennard, EEI, and Gunnar Jancke, chief engineer in charge of research and development, Swedish State Power Board

APC Told Power's Defense Role

- **Chicago meeting hears Interior's Aandahl on responsibilities given the department by Presidential order**

- **Discusses new steam cycles, A-power, fuel pipe line, EHV transmission advances, and industrial transients**

The Department of the Interior has from the President the responsibility for the power industry's role in civil defense, the American Power Conference was told at its 19th annual meeting March 27-29 in Chicago. Assistant Secretary Fred G. Aandahl was the department's spokesman.

The department, he said, will keep the industry informed of planning on the federal level, will coordinate local emergency plans into area and nation-wide planning, and participate with industry in testing the plans.

Furthermore, in the event of attack, the department will assign priorities and make allocations of materials and equipment. It will direct usage and curtailment of energy, thereby relieving the utilities of legal responsibilities, and will take any action authorized in regard to power for the nation's survival, for defense, and for retaliation.

These federal actions, he said, will be carried out through a defense power organization which the department is now developing. A small nucleus, staffed with federal employees, will work with experienced utility personnel. This organization will be appointed by and will represent the Secretary of the Interior in each of 16 power areas.

Working with utility appointees, the department's representatives will stimulate utility planning so that the industry through federal support, backing, and authority will be enabled to carry out its role of supplying power to the best of its ability in any national emergency. For the utilities, civil defense, he said, is an extension of present emergency plans to help minimize the effects of nuclear or other forms of attack.

Such defense planning for the power industry, he said, is essential to national civil defense, made so by post-Korean War international tensions. When effective, it will not only aid the people in post-attack rehabilitation, but could deter a would-be attacker.

Seek New Steam Cycles

Surveying possible new steam cycles, General Electric engineers C. W. Elston and J. E. Downs concluded that it now appears that capital cost of the next immediate step in steam conditions is several times the worth of fuel savings. They felt that new ideas or new materials are needed to insure lower-cost power. They suggested the use of other working fluids, and different

PHILIP SPORN, AG&E Service Corp, chairmanned EHV panel, including F. A. Lane, AG&E, F. J. Lane, CEA, Prof E. T. B. Gross, Illinois Tech, Gunnar Jancke, Swedish State Power Board, and E. C. Starr, Bonneville Power Authority

equipment designs and arrangements of station components.

They discussed the following as possible alternate cycles:

1. Combined steam and gas cycle.

2. Binary cycle using steam in the high-temperature region and freon in the low-temperature end.

3. Benzine as a possible working fluid.

4. Less efficient, minimum-cost turbines.

5. Liquid metal heated in the boiler and pumped to steam reheaters close to the turbine.

6. Multiple reheat steam cycles with very high pressures, but moderate initial temperature.

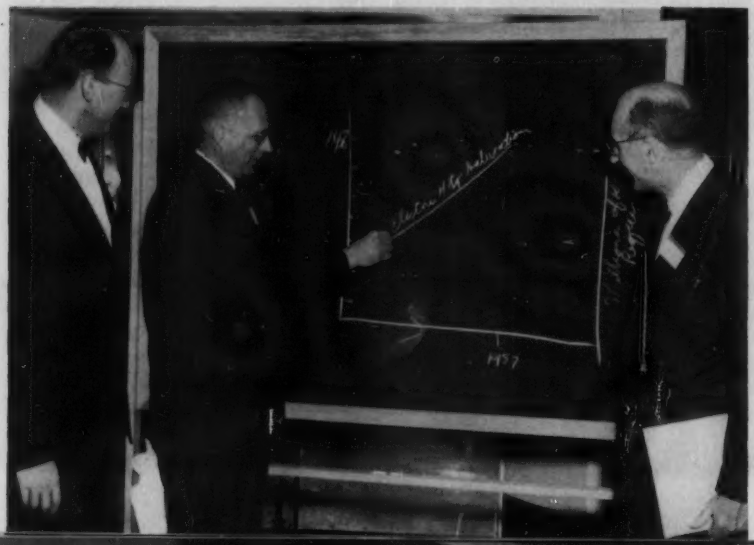
The gas turbine-steam turbine cycle was discussed also by W. B. Wilson, General Electric Co. The advantages of the super-charged cycle boiler, he said, will be utilized in utility and in large industrial plants. But most industrial plants will utilize the gas turbine combined with fuel-fired, exhaust heat-recovery boilers to effect savings in the immediate future.

He said that a combination gas turbine-steam turbine plant may be more economic than a plant utilizing either type of prime mover alone. To back up his contention, he gave heat rate figures for an industrial plant requiring 17 lbs per kwhr of 150 psig process steam and 20-Mw load. For the combined plant the heat rate was 6,100 Btu per kwhr; for a steam turbine plant only 10,600 and, for a gas turbine plant only 9,100 Btu per kwhr.

The attendants at the nuclear sessions heard of possible reduction in capital expenditures for nuclear power plants. This was based on tests Sargent & Lundy engineers conducted on containment vessels. A. Kolflat and W. A. Chittenden presented test data that showed that the heat absorption of the containment vessel's steel plate greatly reduced the temperature and pressure condition that would be expected inside the shell should there be an accidental rupture of the reactor vessel or other equipment.

In fact they feel that additional tests would definitely prove that it is possible almost to eliminate pressure rise in the shell by sufficient water storage properly arranged around the reactor.

W. R. NEW, TVA, shows effect of a 14% saturation of electric heating on industry. Watching are S. M. Miner, York Corp, Gil Freyder, Commonwealth Edison



Solved Reactor Maintenance

A progress report on the Pennsylvania Advanced Reactor Project supplied by W. J. Johnson and D. H. Fax, Westinghouse Electric Corp, and S. C. Townsend, Pennsylvania Power & Light Co, indicated that advances are being made in developing a maintenance program for the aqueous homogeneous reactor. Although earlier studies favored partial plant operation and compartmentalization based on type and function of equipment, the latest maintenance ideas are:

1. Abandonment of the idea of partial plant operation.

2. Compartmentalization of the equipment depending on type and level of radioactivity.

3. Use of semi-direct maintenance techniques wherever possible.

4. Modification of the vapor container design to permit personnel access in limited areas during plant operation.

5. Increasing emphasis on component design to minimize difficulty of maintenance.

The nuclear proponents' task of bringing economic nuclear power is being made more difficult by the ability of plant designers to extract more kwhr by modification of the

present steam cycle. According to S. M. Arnow, Philadelphia Electric Co, the Eddystone supercritical pressure units will use a low level economizer to heat feedwater in lieu of a second stage of conventional feedwater heating, and steam from the first heater will temper the incoming air. The heat of the steam will be transferred to the air by a closed water loop.

The net result of this scheme, in which the boiler and turbine heat recovery processes are interrelated, is a reduction of plant heat rate of 100 Btu per kwhr. This is equivalent to an increase of about 1¼% in plant thermal efficiency.

Although there has been some difficulty in getting into operation the 108-mile coal pipeline from Georgetown, Ohio, to Cleveland Electric Illuminating Co's East Lake plant, C. A. Dauber, CEI, predicted an expansion of coal transportation by pipeline in the future when conditions are ideal. Dauber analyzed the economics involved in the $12½-million project and said there would be substantial savings over the $3.30/ton freight rate. CEI has contracted for 1¼ million tons of coal per year via the pipeline.

Hydro, Steam Cut Cost

Hydro and steam plants in combination provide power at the lowest cost, except where fuel is cheap or hydro inexpensive to develop, said Walter Dreyer, Pacific G&E Co. The most economical combination of power sources depends upon the system load curve, generating plant cost, transmission, and fuel price.

In California today hydro plants with additional generating capacity to help carry peak loads, combined with steam plants operating at higher-than-system load factor, make for economical operation. Hydro plants must meet peak requirements with adverse water and not require steam plants to operate at capacity factors over 90% monthly or 80% annually.

Multi-purpose projects seldom provide favorable power characteristics but can be integrated with single-purpose hydro and steam plants for maximum use of their available capacity, continued Dreyer. For example, the 625-Mw Central Valley project can provide 450 Mw of dependable power under adverse water conditions when integrated with the California utility system. But its capacity factor would fluctuate between 16% during adverse months and 63 to 74% during heavy irrigation demand.

NATHAN COHN chairmans load control panel: E. C. Glass, Northern States, R. H. Travers, Ohio Edison, S. B. Yochelson, Goodyear, and C. P. Almon Jr, of TVA

Operation of the TVA system involves coordinating 45 hydro and 14 steam plants to carry a 9-million-kw system load most economically, said R. A. Monroe. During high water periods its nine main-river hydro plants generate on base load and the tributary hydro plants are curtailed to store water. During low-flow periods, all hydro plants are used for peaking with their output curtailed off peak. Production cost during 1956 averaged 1.06 mills per kwhr for hydro and 2.66 mills per kwhr for steam.

Operating the TVA system to provide reliable service involves load shedding in emergencies, economic dispatch for lowest incremental cost of delivered power, automatic bias-frequency control in the 50,000-Mw interconnection, and coordination of hydro and steam, said C. L. Karr and C. P. Almon, Jr.

The basic philosophy of load control is to maintain an operating system, they continued. Relays and automatic reclosing are applied to prevent line overloading by keeping operable lines in service. Backing up this normal procedure is automatic load shedding in certain areas to keep load in balance with generation and restore service as more power becomes available. This is carried to the point of isolating one generator in a steam plant to supply auxiliaries during a severe disturbance. Manual shedding can be ordered. Such methods have carried the system through a 1,000-Mw loss of generation and a 1,000-Mw load drop without tripping interconnections or swinging frequency over 0.3 cps.

Installing automatic load-frequency control to 12 units in 3 Northern States Power Co steam plants in August 1955 gave operators an opportunity to become accustomed to area control. Northern States at that time had about 1,500 Mw of generation to serve a 1,171-Mw peak in 1956, said E. C. Glass. Recent completion of a tie to U. S. Reclamation's Missouri River system linked the Minnesota utilities to the 45,000-Mw Interconnected Systems Group, a tie which will shortly be strengthened by three others. This necessitated boosting the system's response rate to 12 Mw per min to minimize the effect of load changes on the tie line.

England Saves with EHV

The British 275-kv grid, with 511 circuit miles added during 1956, is expected to save $300 million in generation and transmission additions before 1960 for $180 million spent on interconnections, said F. J. Lane, Central Electricity Authority. Its voltage before 1948 was the highest standard for which reliable lines and equipment could be built under British atmospheric conditions.

Successful operation in 1953 of a 42-mile single-circuit, 275-kv line of twin ACSR conductors guided design of subsequent lines, continued Lane. Double-circuit construction conserves rights-of-way. Lines in the north use twin 0.175-sq-in. conductors for 350-Mw capability and lines toward load centers to the south are twin 0.40-sq. in. copper equivalent for 550-Mw ca-

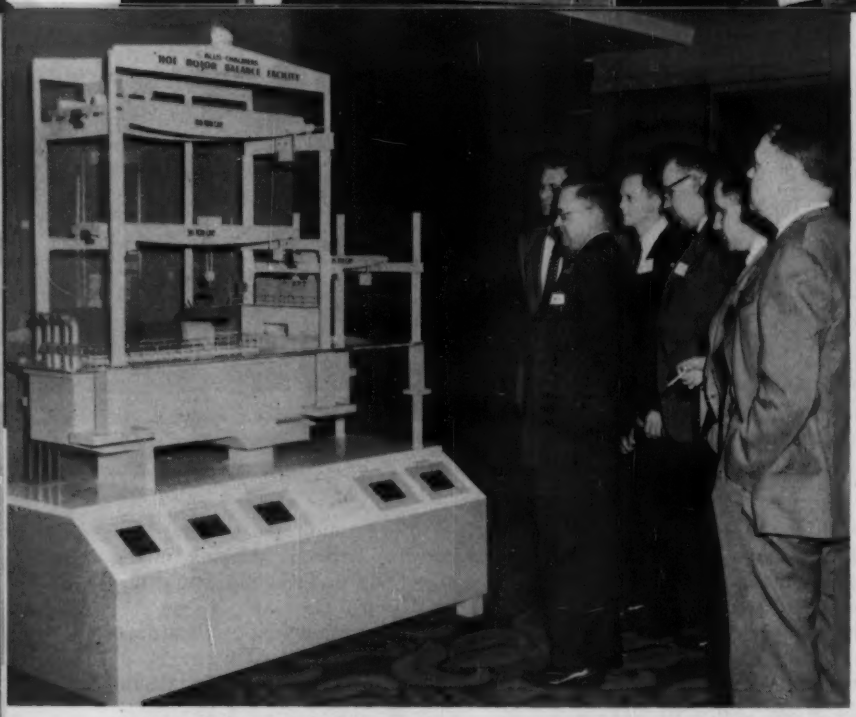


EXHIBIT of hot rotor balance, presented by Allis Chalmers Mfg Co, attracted attention of many utility people who attended the American Power Conference

pability. Structures of several lines have 85-in. minimum clearances, suitable for 380 kv.

Swedes Stay at 400 Kv

Sweden, with the 400-kv system introduced in 1952 now extended to 1,700 miles and supplying 2,500 Mw of load, foresees an 8,000-Mw future, said Gunnar Jancke, Swedish State Power Board. Radio interference has not been serious. Lightning faults of 0.25 per 100 miles per year have confirmed calculations.

System voltage will not be boosted above about 420 kv because:

1. Capability beyond the 650 Mw of 400-kv circuits with two 1.25-in. 1,170 MCM, ACSR conductors at 18-in. spacing per phase cannot be used effectively in South Sweden.

2. Savings are only 10% for adding a third conductor to main line bundles and adding autotransformers to get 1,030-Mw capability at 500 kv.

3. Savings are only 15% for building new lines with 4-conductor bundles and rating them 1,720 Mw at 650 Kv.

Series capacitors are assumed in all comparisons, said Jancke. An installation compensating 40% of line reactance boosts transmission capability of a 400-kv line to 650 Mw as against 400 Mw without capacitors. High-speed reclosure after 4-cycle clearing of system faults has proved desirable.

Insulation levels were 1,600 kv for the initial lines and 1,775 kv for stations. Experience and expansion of the network will permit cutting these to 1,400 and 1,425 kv, Jancke said.

Operation of the American G&E and Ohio Valley Electric 345-kv systems has been satisfactory, reported F. A. Lane. Circuit mileage totals 1,417, much of it with two or more years of service. All lines were initially energized at 300 kv or less until tests proved them free from radio interference. Since raised to 345 kv, they are monitored continuously for R.I.

Operating experience confirms the soundness of the original design, claimed Lane. But lightning flashovers have averaged 10 per 100 miles per year despite shielding and tower grounds below 20 ohms where a rate of 0.5 had been expected. High speed clearing and reclosing prevented serious trouble, and most faulted circuits reclosed successfully. Extensions will add six circuits and 714 miles, Lane said. All will have two shield wires instead of one. One extension will include two experimental sections of bundled conductors; another, special design to avoid galloping contact under icing.

The steady-state capability of 230, 345, and 460-kv lines is limited by economics for distances up to 200 miles and by stability for greater distances, reported E. C. Starr, Bonneville Power Administration. All three voltages have been studied for system requirements in 1975, he said, and indications are 345 kv loaded to 400 Mw would save 15% over 230 kv. The 460-kv line offers 10% additional savings if its 700-Mw rating can be tolerated, he said, But these savings only materialize for systems large enough to use effectively the high capabilities of EHV circuits.

Starr described investigations of fast automatic reclosing after faults as an adjunct to line protection. Where such breaker action permits omission of shield wires, it offers savings in tower weight worth up to $1 million per 100 miles of line, he said.

Attack Automation Needs

Transient conditions cause problems when modern industrial plants with automation processes move outside areas of concentrated power supply, said F. X. Doran, Ford Motor Co.

Doran and C. E. Quick, Detroit Edison Co, described cooperative efforts to solve these problems. Tests showed that controls were much more sensitive to transient conditions than the machines themselves. Accordingly, constant-voltage transformers were provided for central power sources as more economical than motor generator sets. But these transformers did not solve the problem when used with electronic computers, due to harmonics.

Doran and Quick agreed that the problem must be recognized, and that utilities should indicate what power supply performance is practicable so that customers could write proper requirements into specifications.

Real estate developers pay the difference in cost between overhead and underground distribution when they want underground facilities in residential areas of Detroit Edison Co territory, said E. C. De Baene. Customers pay $2 per month service charge to cover additional cost.

Gives System Planning Criteria

DISTRIBUTION
Design

REA bulletin guides rural managers in designing distribution facilities with an eye to future system requirements

The Rural Electrification Administration has issued a new bulletin defining sound rural distribution system management as the provision of adequate service at the lowest cost to the consumer. System planning, says REA, is sound when it achieves the following:

1. Orderly system development to minimize waste due to the premature inadequacy of lines and substations.

2. System expansion that allows new investment in facilities to pace load growth and revenue.

3. Maximum use of opportunities to improve service quality.

4. Maximum use of developments in equipment and application.

5. Correlation of power supply, transmission, and distribution to maintain reasonable economic balance.

System planning must be long-range and free from restrictions based on the present system design, REA declares. It should be based on load levels great enough to require consideration of an increase in the capacity of substations, feeders, and other major components. Any interim change should fit into the overall plan.

Study Causes of Outages

Analysis of system performance should review voltage conditions and include measured data of voltage, current, and voltage levels at power supply points and substations. Voltage drop calculations based on loading are helpful where adequate measurements cannot be obtained. Where outages appear too many, probable causes should be studied.

Operating records show overall losses and where losses are excessive. Reduction of such losses, along with the number and handling costs of outages, are part of proposals to cut operating costs. Planning should cover the long-range overall load level, area load levels, potential customers, and special loads.

The overall load level is described by the bulletin as the kwhr per customer per month in the long-range plan, a peak-month average usage for all customers the system is expected to obtain. Large power users and concentrated loads are excluded. The overall load level should be three to six times today's average kwhr per consumer per month for the peak month.

Area load levels reflect substantial differences in consumer usage which should be considered for the long-range future. Boundaries of areas of different usages should be plotted on the system map, along with long-range kwhr per customer per month for each area.

Consider Big Loads Separately

Large power customers and concentrations of small oil well pumping and small irrigation loads are considered "special." When the location and size of potential special loads involve uncertainties, such loads may be considered by management as individual cases.

Peak demands for the whole or part of a system can usually be determined from REA tables. When load conditions warrant the use of demands other than those tabulated, operating records, and trends in consumption and application should be considered

It is assumed that systems operate at 0.9 pf. Correction of power factor is an operating problem, not part of system planning. When large power and concentrations of oil-well pumping and irrigation loads are a significant part of the system load, base system loading should be guided by an analysis of the load, taking into account these special loads.

Power sources should meet system requirements of quantity, reliability, and voltage levels. Cost and availability of power when needed should be factors in the selection of optimum number of sources and their capacities. Sources must be capable of supplying the power called for in estimates in the long-term system plan. They must maintain REA voltage levels.

Short transmission, whether by line, network, or loop, is a preferred source, and outage data on sources should be evaluated. The nearest and cheapest source of power is not acceptable when it does not meet service continuity standards.

Sizes and numbers of substations should be based upon the optimum size and number of distribution feeders and the size, voltage, and length of transmission lines supplying them. Economic balance among distribution, transmission, substations, and cost of power is a major design consideration. Smaller substations are preferred, and mobile ones should be considered for emergencies.

Major design considerations pertaining to distribution are: Conductor economics and losses, conductor size and phasing, conversions, routing, voltage level, voltage drop, and service reliability.

Select Substation Size Carefully

The most economical conductor sizes, circuit voltages, and number of phases cannot always be used in a combination which still meets voltage and service reliability standards. But much can be done by careful selection of substation size or number of power sources.

Conversion of existing lines may be the best solution, although the construction of new lines or establishment of new sources of power should be carefully considered as an alternative because existing lines frequently have not been designed for economical conversion, a new line may lead to a better long-range plan for system development, or the existing line may not be sound enough. Conversion should not be proposed until the load reaches a magnitude at which savings in losses could equal fixed charges on the cost of converting the line.

(Continued on page 114)

What Long Island Lighting Co Learned About Pipe-Type Cable

1. It appears necessary for the present to limit high load-factor pipe-type cables to 50C maximum temperature to avoid excessive loss of soil moisture and consequent run away condition, especially during sustained dry spells any time of the year.

2. Excessively dry soil conditions with correspondingly high cable temperatures can occur during winter as well as summer dry spells.

3. Paved roads may create a sufficient moisture shield to prevent adequate moisture restoration around cable pipes unless natural hydraulic head or high water table is available.

4. High load-factor operation appears to accelerate loss of soil moisture, probably by not providing a sufficient cooling period for moisture restoration.

5. It is practically impossible to locate the hottest spot along a pipe-type cable. However, by careful inspection of the route and with knowledge of the soil conditions found during pipe trench excavation, a number of thermocouples can be provided along the cable route to furnish a realistic temperature profile. Soil resistivity conditions can also be investigated by means of the "Transient-Needle Method."

6. While artificial cooling can be provided to cool a particular hot pipe section, there is no guarantee that an equally hot or hotter section does not exist elsewhere along the route. Artificial cooling of a long pipe-type cable where several miles of hot pipe may be encountered is costly.

Utility Seeks Data on Soil Behavior

TRANSMISSION
Operation

"Hot spots" in pipe-type cable lead Long Island Lighting to investigate thermal resistivity and moisture retention

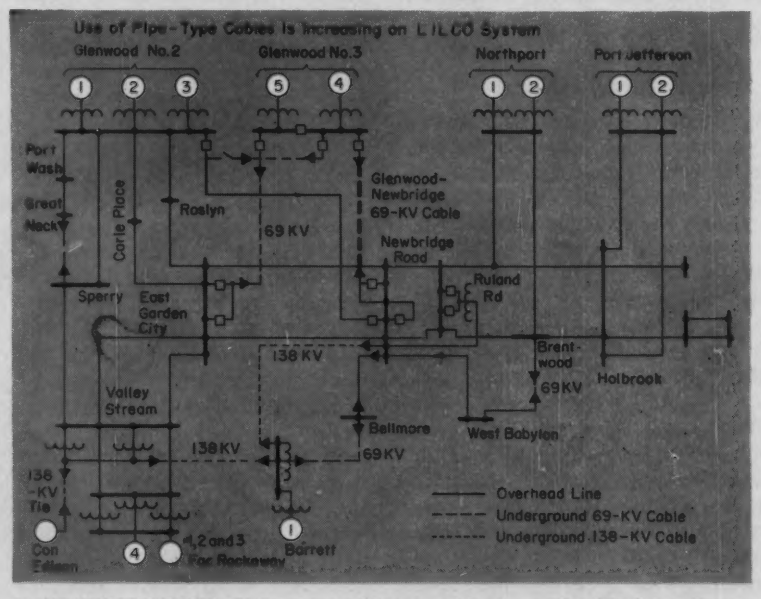
J. R. GUMMERSALL, System Operating Engr, Electric Operating Department, and **F. J. WELLS,** Engineer, Engr Department, Long Island Lighting Co, Hicksville, New York

Long Island Lighting Co's experience in recent years with a 69-kv pipe-type cable indicates that knowledge of soil behavior with respect to thermal resistivity and moisture retention and restoration is inadequate. This is particularly true when soil is subjected to thermal cycles produced by high load and loss factor operation.

In the summers of 1954 and 1955 the New York utility experienced hot spot conditions, not entirely unexpected, on the load end of a cable carrying the output of a generator into a main substation. Charging current makes this the high current end. But a later difficulty in March 1956 came as a surprise. At that time ground ambient temperatures were favorable. In all instances forced curtailment of capability on the cable was necessary.

Studies made under actual operating conditions following the March disturbance led to the conclusions mentioned above. All point to the need for conservative operation of cables until additional information can be secured.

Since 1948 the Long Island Lighting has installed five 69-kv pipe-type cables totaling 36.6 miles and three 138-kv pipe-type cables totaling 22.2 miles on the system. Two of the 69-kv cables, including the one under discussion, carry the out-



EIGHT INSTALLATIONS of pipe-type cable are on the Long Island Lighting Co system. Five of these cables are at 69 kv and the remaining three are at 138 kv

put of 115-Mw generators into main substations near the load center of the system. The cable in question ties the Glenwood No. 4 generator with the Newbridge Road Substation.

It consists of about 11.1 miles of 69-kv, 3-1/c, 2,000-MCM cable pulled into a steel pipe of 6⅝-in. OD, ¼-in. wall, with an interior coating of No-oxide and a $\frac{7}{16}$-in. exterior of Somastic. The pipe is buried at an average depth of 3½ ft.

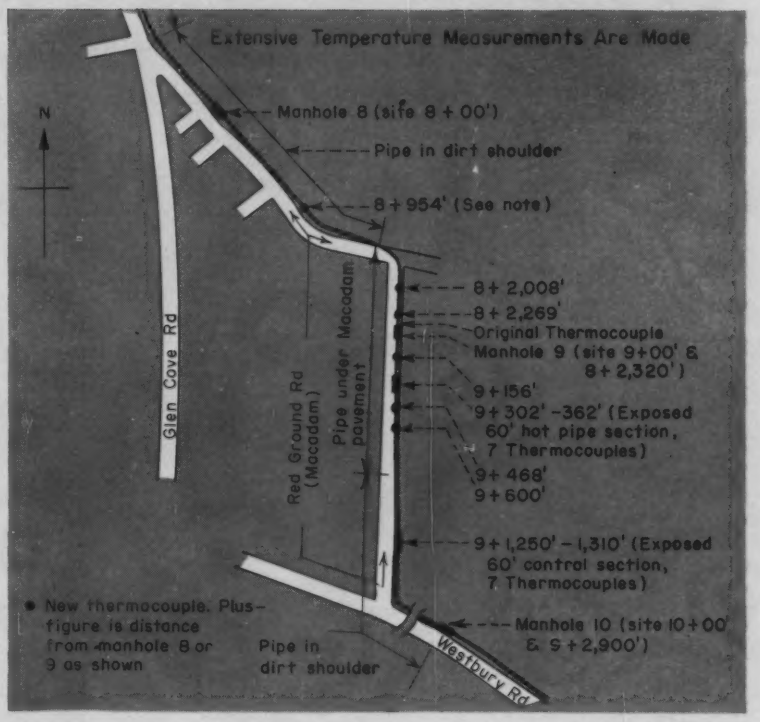
Fifteen copper- constantan thermocouples are placed in a solder-filled protective connector assembly and welded to the pipe under the Somastic coating and measure temperature along the length of the pipe.

The circuit was placed in service on Nov. 21, 1952, as a capacitor energized from the Newbridge Road end. It carried load on Dec. 6.

It was expected that temperatures would increase for about a year until a normal range was reached, after which temperature would vary with generator load and ground ambient temperature. To check this prediction, monthly thermocouple readings were begun.

Typical daily load factors for the cable have averaged between 65 and 75%, with a maximum daily load of 900 to 1,100 amp. Load factors have been higher than usual because of use as a generator lead.

During the summers of 1954 and 1955, hot spot temperatures were detected and studied at the Newbridge Road high-current end of the cable. At these times load curtailment on the cable was necessary and was achieved by paralleling with the bypass circuit and restricting generator output. A pipe temperature of 62C was recorded. Soil moisture samples taken in proximity to the cable showed readings of less than 1% moisture by weight.


Extensive Temperature Measurements Are Made
N
Manhole 8 (site 8 + 00')
Pipe in dirt shoulder
8 + 954' (See note)
8 + 2,008'
8 + 2,269'
Original Thermocouple
Manhole 9 (site 9+00' & 8+2,320')
9 + 156'
9 + 302' - 362' (Exposed 60' hot pipe section, 7 Thermocouples)
9 + 468'
9 + 600'
9 + 1,250' - 1,310' (Exposed 60' control section, 7 Thermocouples)
Manhole 10 (site 10+00' & 9+2,900')
Glen Cove Rd
Red Ground Rd (Macadam)
Pipe under Macadam pavement
Pipe in dirt shoulder
Westbury Rd
• New thermocouple. Plus-figure is distance from manhole 8 or 9 as shown

IN MARCH 1956 higher than normal pipe temperatures were noticed near Manhole No. 9. Tests substantiated the theory that excessively dry soil was the cause

Readings have been taken at least monthly during other than summer periods, and profiles of temperatures along the length of the cable have been plotted so that the behavior of each thermocouple with respect to the rest could be studied. This procedure led to the discovery in March 1956 of higher than normal temperatures on a thermocouple located near Manhole No. 9. It is located about ⅓ of the way from the Glenwood end. This thermocouple had never before registered the limiting hot spot.

Red Ground Road, where this thermocouple is located, is in the northern region of Long Island about 200 ft above sea level. The area is slightly hilly although along the hot-pipe section the land is fairly flat with gentle grade. Subsoil is coarse gravel and boulders with a shallow cover of sandy loam. During installation of the cable pipe, this coarse subsoil along the section

Table I—Current Carrying Capacity for 69-kv Pipe-Type Cable

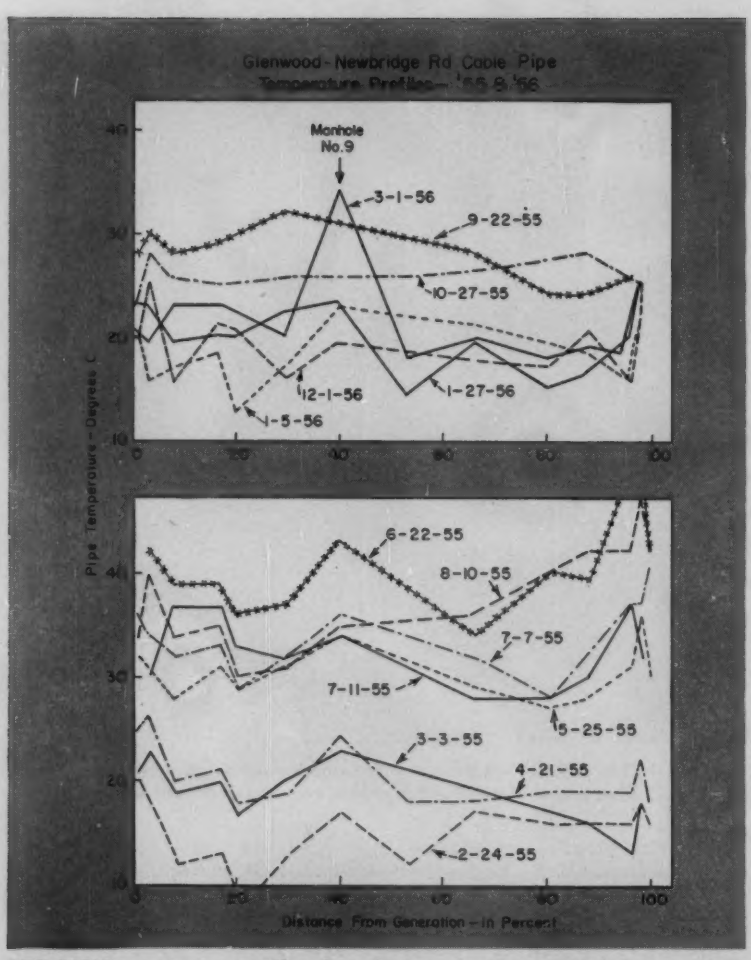
Load Factor	Earth Ambient	Normal Current Carrying Capacity Mfr A	Normal Current Carrying Capacity Mfr B	Emergency Current Carrying Capacity Mfr A	Emergency Current Carrying Capacity Mfr B
100%	25C	884	960	1,048	1,110
75%	25C	1,048	1,135	1,245	1,315
50%	25C	1,296	1,360	1,508	1,575
100%	5C	1,059	1,142	1,196	1,263
75%	5C	1,257	1,358	1,421	1,498
50%	5C	1,521	1,625	1,723	1,797

Ratings are based on a soil resistivity of 90 ohms per cm.[3]

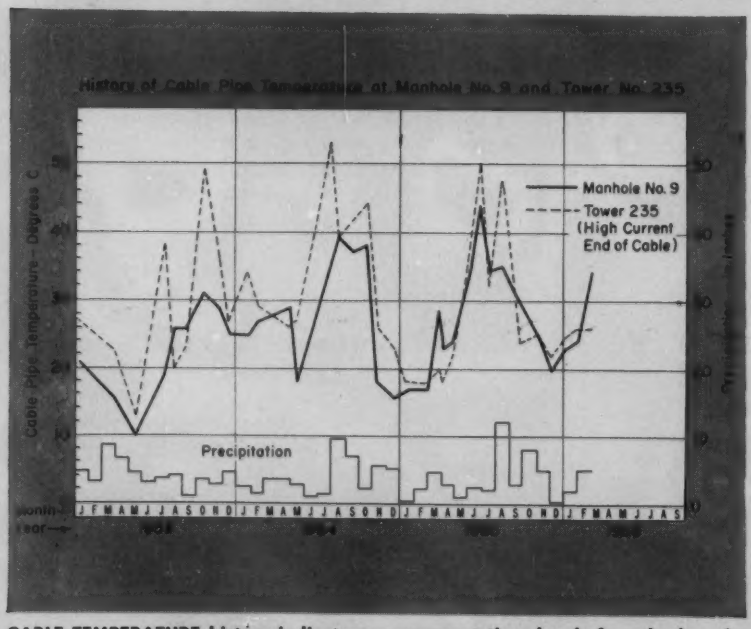
Table II—Pipe Temperatures for Operating Conditions

	Copper Temp	Corresponding Pipe Temp
Normal Operation.....	75C	50C
Emergency Operation...	95C	60C

Additional data indicated that thermal gradient between copper and pipe temperature is appreciably less than indicated above, however, no change was made in the operating limits as by this time operating experience had shown that 50C pipe temperature appeared to be somewhat critical.



PIPE CABLE temperature profiles show that temperature at Manhole No. 9 was on the average the same or higher than at the far, high current, end of the cable


History of Cable Pipe Temperature at Manhole No. 9 and Tower No. 235
Manhole No. 9
Tower 235
(High Current
End of Cable)
Precipitation
Cable Pipe Temperature - Degrees C
Precipitation - Inches
month—
year—
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S
1953
1954
1955
1956

CABLE TEMPERATURE history indicates an apparent time lag before the benefits of moisture following heavy precipitation are felt by the buried pipe cable

trench starting 600 ft north and terminating some 700 ft south of Manhole No. 3 was replaced with gravel bank run. Beyond these points, trench subsoil is sandy loam mixed with gravel.

Water table is about 100 ft below the Red Ground Road surface. Catch basins installed in 1955, 500 and 900 ft south of Manhole No. 9 deprived the area of run off water.

Prior to March 1, 1956, pipe temperatures indicated by the thermocouple near Manhole No. 9 had not reached a magnitude that would cause any concern. However relative to other thermocouple stations, temperatures were at times somewhat higher than normal.

Maximum of 41C Reached

On March 1, a routine check of the Glenwood-Newbridge cable pipe disclosed 34C pipe temperature near Manhole No. 9. Although not excessive, this temperature was abnormal as it was 9C higher than the next highest readings. Rechecks indicated sustained abnormal temperature. A maximum of 41C was reached on March 7.

The unseasonable temperatures were attributed to either of two causes; excessively dry soil, or abnormal dielectric loss or some other cable defect. The fact that Red Ground Road macadam pavement shields about 1,500 ft of the cable pipe from direct moisture lent support to the dry soil postulate. On the other hand, the somewhat soggy open field and lawn areas adjacent to the paved road gave the impression that subsoil would be relatively wet. Then again, abnormal heat creation by the cable resulting in high pipe temperatures could eventually cause loss of soil moisture. Another speculation was that a 16-in., 1,000-Btu gas transmission main located about 18 in. from the cable pipe might be contributing heat to the soil.

To obtain the facts additional thermocouples were installed, soil samples were analyzed for moisture, and load was restricted by 50C pipe temperature.

Results of this program, completed March 22, left the cause unsolved. The highest temperature reached was 50C, and it was interesting to note that thermocouples 300 ft apart registered temperature differences as much as 17C. The

gas main temperature was found to average 12C indicating it actually provided a slight amount of cooling. Moisture at the cable pipe under pavement was excessively depleted, as low as 0.1%.

While this pointed to the dry soil theory, thermocouple readings indicated a maximum peaked hot spot of 50C about 300 ft south of Manhole No. 9, possibly caused by abnormal internal cable condition. In view of this, it was decided to expose and measure the temperature of 60 ft of cable pipe in a moist soil area. Seven thermocouples spaced 10 ft apart were installed on each exposed pipe section.

Dry Soil the Cause

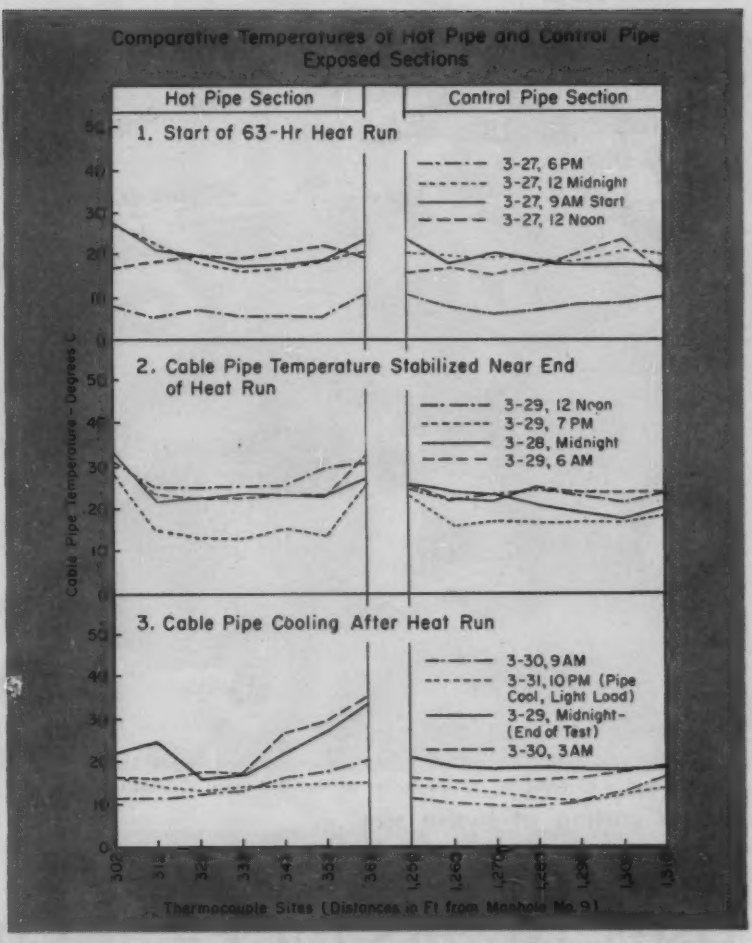
If a localized cable hot spot existed, temperatures along the exposed pipe situated in a relatively uniform cool air medium would distinctly peak at the hot spot. If such a spot were non-existent, hot section pipe temperatures would be uniform along the pipe but lower than those at each end of trench where soil thermal resistivity effect would be felt. Also, temperature level would be about equal to that at the identical control trench.

Cable load was held at 880 amp for 31 consecutive hr then at 910 amp for the next 32 hr. Maximum temperature reached was 45C at Manhole No. 9 and 41C at the high current end of the cable.

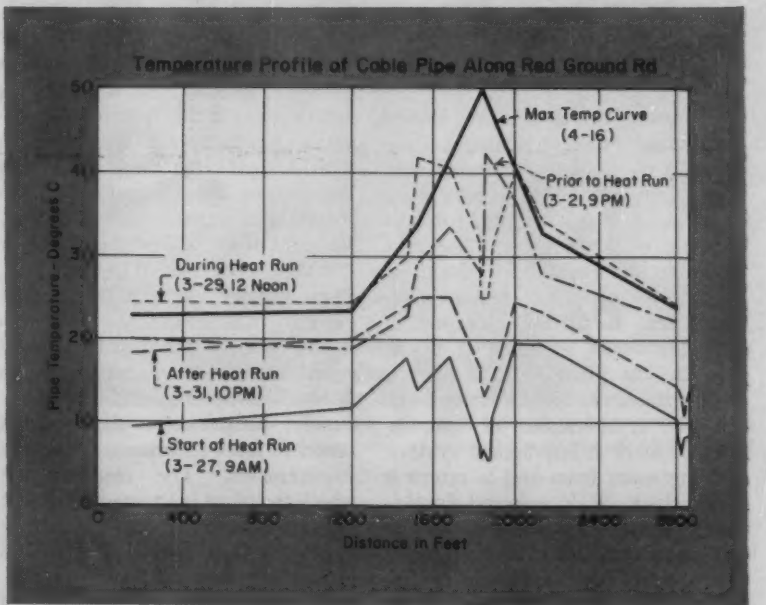
No evidence of abnormal internal cable heating was indicated by this test. Near maximum temperature attainment oil flow in the pipe minimized, and both the hot and control exposed pipe sections disclosed even distribution and about equal levels of pipe temperatures.

This substantiates the theory that excessively dry soil was the cause of the abnormally high pipe temperatures.

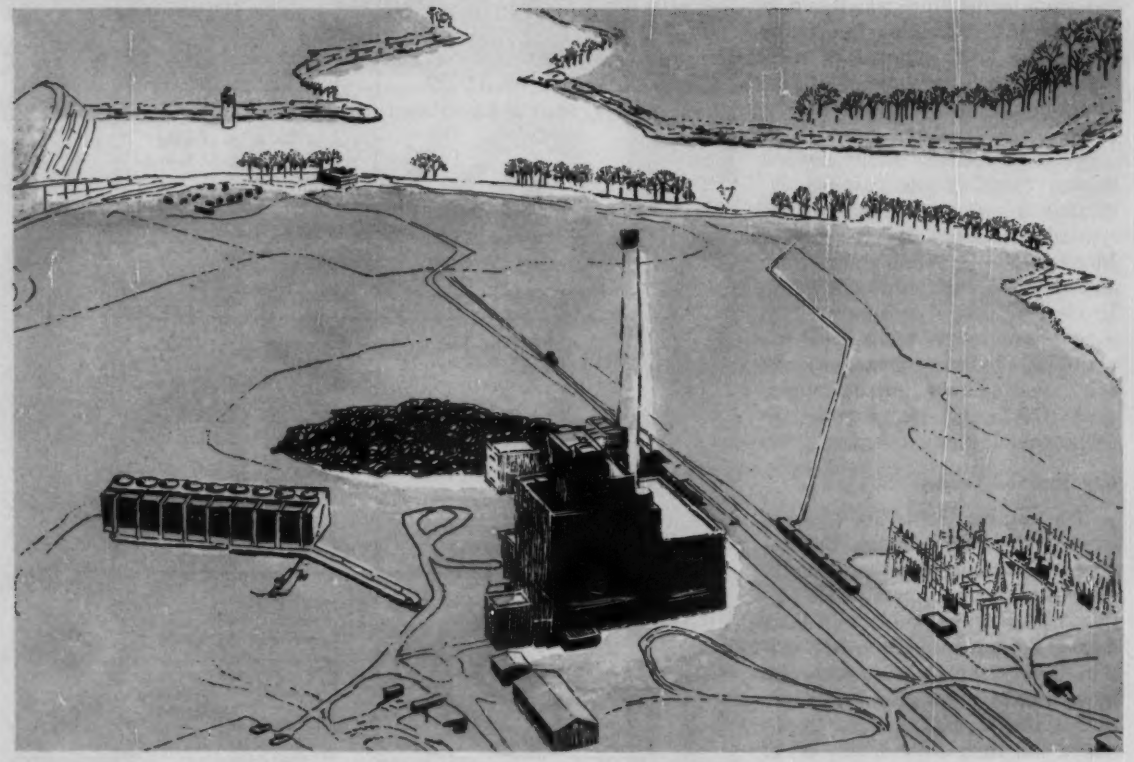
After this investigation the exposed pipe sections were restored to their original condition. However, new thermocouples at these and the other sites were left intact and terminated in curb boxes for future tests. Also, galvanized steel pipes for introducing water above the cable pipe were installed at ten ft intervals between thermocouples and terminated in curb boxes to permit future study of water dispersion around the cable pipe.


Comparative Temperatures of Hot Pipe and Control Pipe Exposed Sections
Hot Pipe Section
Control Pipe Section
1. Start of 63-Hr Heat Run
3-27, 6PM
3-27, 12 Midnight
3-27, 9AM Start
3-27, 12 Noon
2. Cable Pipe Temperature Stabilized Near End of Heat Run
3-29, 12 Noon
3-29, 7PM
3-28, Midnight
3-29, 6 AM
3. Cable Pipe Cooling After Heat Run
3-30, 9AM
3-31, 10PM (Pipe Cool, Light Load)
3-29, Midnight-(End of Test)
3-30, 3AM
Cable Pipe Temperature - Degrees C
Thermocouple Sites (Distances in Ft from Manhole No. 9)

TEMPERATURE COMPARISONS of an exposed pipe section at the hot spot and an exposed section in a moist area did not show any abnormal internal cable heating


Temperature Profile of Cable Pipe Along Red Ground Rd
Max Temp Curve (4-16)
Prior to Heat Run (3-21,9PM)
During Heat Run (3-29,12 Noon)
After Heat Run (3-31,10PM)
Start of Heat Run (3-27,9AM)
Pipe Temperature - Degrees C
Distance in Feet

HIGHEST TEMPERATURE reached was 50C. This occurred near Manhole No. 9. Thermocouples only 300 ft apart recorded temperature differences of about 17C



Steam station at hydro site . . .

Uses Towers for Plant Cooling

E. W. **BROWN**, Vice President, Kentucky Utilities Co, Lexington, Ky., and **W. R. STEUR**, Mechanical Engineer, Sargent & Lundy, Chicago, Ill.

Although the new E. W. Brown generating station of Kentucky Utilities Co overlooks a reservoir with a capacity of 123,000 acre ft, a cooling tower was installed for condensing water purposes. The lake will be used only for make-up water. Reasons for this arrangement are: **1.** Surface elevation of the lake varies as much as 60 ft; and **2.** The plant is on a plateau 100 ft above the highest water level.

This combination of circumstances made it impractical to draw cooling water from and to return it to the lake. Wide seasonal fluctuations in run-off in the 410-sq-mile drainage area and the topography made a continuous supply of circulating water not feasible.

First unit of the station will be a 100-Mw preferred standard turbine generator. Steam conditions will be 1,450 psi, 1,000F/1,000F for the 3,600-rpm tandem compound machine. It will be the largest unit on the system. Yet, because Kentucky Utilities operates with several interconnections with neighboring utilities and expects to maintain a normal reserve, loss of the 100-Mw unit in the 550-Mw system is not expected to be serious. Plans provide for an ultimate plant capacity of four units.

Selection of the plant site was based on fuel costs varying with different locations, and on water supply, proximity to the system's center of load, and transmission line requirements. The reservoir on which the plant is situated is formed by Dix dam, part of a 30-year-old hydroelectric development. The hydro plant has a 30-Mw capacity.

The system load dispatching and load control center will be in a building next to the lake.

Plant design took advantage of the location, insofar as proximity to the load center and transmission facilities were concerned. Maximum flexibility in operation will be provided. Cost for the first two units is estimated at $118 per kw of capability, excluding switchyard, and based on today's prices.

The water problem, however, was not completely solved by cooling towers. It was necessary to get make-up water for the condenser up a sheer cliff. Plant grade is 150 ft above average lake level. Experience prompted the selection of conventional vertical mixed-flow pumps. Two were installed. Each has a rated capacity of 4,000 gpm at 297-ft net head with 95-ft columns to reach a position from above highest water to below the low-water line of record. At the pumps there is an abrupt drop from the full-lake elevation, 760 ft, to elevation 613 ft. Pump suction is

at elevation 675 ft. Pumps are on a steel semi-cantilevered platform anchored into the side and top of the bank with the columns hanging down parallel to the cliff face.

Service water will be strained and, because of the widely varying lake level, a pressure regulating valve will hold pressure at about 20 psi in the plant basement headers.

Because of the depth of suction at the lake, the service water normally has a temperature between 55 and 70F. Water from the lake will be used, after straining, for cooling turbine-generator oil and in the hydrogen and bearing water coolers. After use for cooling, the water will be recovered and turned into the circulating water system. This quantity of water will provide cooling tower make-up with sufficient excess for blowdown, thus eliminating the chemical treatment of circulating water over most of the load range. Additional make-up will be provided automatically at higher loads.

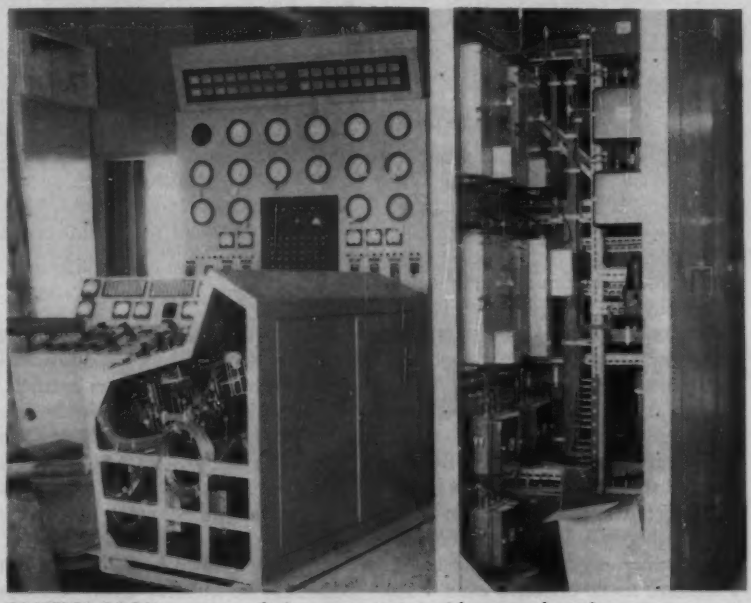
COOLING TOWER provides condenser water although plant is on lake. Pipes were run above ground to save the cost of trenching in the solid rock foundation

Closed-Circuit System Used

To avoid poor performance, corrosion, and maintenance expense experienced with the once-through system, a recirculating closed-circuit system was adopted for cooling water for bearings, oil coolers, and compressor jackets. A circulating pump will take suction from an elevated storage tank and discharge it through a heat exchanger where bearing water will be cooled by service water. Distribution will then be made at two pressure levels; one for equipment in upper parts of the building, and the other for the lower areas. A duplicate circulating pump and cooler will serve as spares for both units.

Cooling towers are at the higher part of the site, north of the plant, and arranged for minimum windflow interference from adjacent future towers and the building. Main circulating water lines were run above ground, except at the rear of the plant, to minimize excavation.

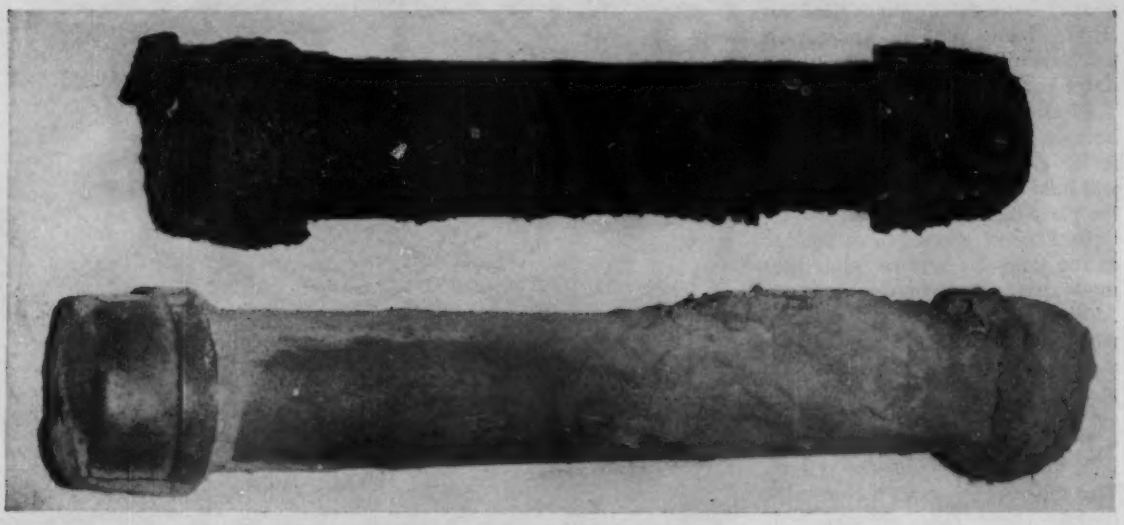
To save on building costs, the first unit was laid out to eliminate all unnecessary volume and to place out-of-doors equipment where it would be readily operated and maintained. The resulting building requirements, 17.7 cu ft per kw excluding the coal crusher, are quite low for an indoor plant.



CONTROL ROOM corresponds in compactness with general station arrangement. Rear of benchboard is separated from face of vertical gauge boards by 3-ft aisle

The compact station arrangment made practicable a correspondingly compact control room. Miniature controls and indicators will be used extensively. Outside faces of the vertical gauge boards will form the wall of the control room. To complete the enclosure, insulated panels will extend from the top of the gauge boards to the floor above.

The control room will be in the bunker bay at the temporary end wall where it will adjoin the Unit 2 control room.



Comparison of top pipe with lower one shows . . .

Fly Ash Prevents Pipe Corrosion

W. C. THOMPSON, Supervisor of Testing Laboratory, Northern States Power Co, Minneapolis, Minn.

Experiments conducted by Northern States Power Co indicate that surrounding buried pipe with fly ash prevents pipe corrosion. The availability of fly ash suggested its use in solving the problem of pipe corrosion in soil with a high pH.

Reinforce steel in concrete is protected by the alkalinity of its environment. The pH of boiler feed water is increased to 9.0 to retard corrosion, and the pH of boiler water at 10.5 to 11.5 prevents pitting of metal.

Research on byproduct fly ash showed that iron pipe buried in soil is protected against corrosion when it is embedded in fly ash. Investigation may reveal such protection continues to be effective even when the alkalinity of the fly ash is reduced by the soil water.

Two short sections of 1½-in. black iron pipe, capped at each end and sandblasted clean, were buried about 18 in. in sandy soil. One was surrounded by 6 in. of fly ash. When the pipe sections were removed 21 months later, the pipe buried in soil only was badly pitted; the one environed in fly ash was not pitted.

The fly ash was from a 900-psi boiler burning pulverized Illinois coal and had the analysis shown in the table. The pH of such fly ash is 10.5 to 11.9. In this range, iron is not readily attacked by soil waters, perhaps because of the low solubility of ferrous hydroxide under these conditions.

Protective Film Formed

Hard waters are not as corrosive as soft waters, and fly ash adds considerable hardness to water extracts. A protective film of insoluble calcium carbonate might form on iron embedded in fly ash. Another possibility is that wet fly ash reduces the oxygen in contact with the metal.

It is not known how long fly ash continues to protect iron. Its hydroxide is changed to carbonate which precipitates, and the soil waters then become lower in alkalinity, hardness, and pH. This is shown by tests on water extracts of the original fly ash, of the fly ash adjacent to the buried test pipe after 21 months in the ground, and of the sandy soil which was in contact with the pipe. In each case, 50 grams of material were extracted with 200 milliliters of distilled water at 25C.

It is likely that the protective water-soluable constituents of fly ash are leached out by soil waters. At any rate, 21 months' pipe protection was obtained from the addition of fly ash. Experiments of longer duration are planned. They will include lime-fly ash mixtures, which harden like cement through chemical reaction. These may retard loss of alkalinity.

Analysis of Fly Ash
(as received)

Moisture	0.15%
Loss on ignition	1.18%
Silica, SiO_2	47.50%
Sulfur trioxide, SO_3	1.65%
Iron Oxide, Fe_2O_3	17.88%
Alumina, Al_2O_3	19.80%
Calcium oxide, CaO	7.00%
Magnesia, MgO	2.32%
Alkalies, Na_2O	0.81%
pH	11.8
Specific gravity	2.46
Fineness (specific surface)	3,610.00
Fineness, passing 200 sieve	94.1 %
Fineness, passing 325 sieve	89.2 %
Fineness, passing 400 sieve	84.0 %

POWER PLANT SERVICES REPORT

Delaware Power & Light's new 50,000-kw plant hastened to completion in 18 months

One of the most recent and significant additions to the Delaware Valley's booming industrial area is Tidewater Oil Company's new, ultra-modern Delaware Flying A Refinery, nearing completion 15 miles south of Wilmington. This installation has the largest initial capacity of any refinery yet built, and, as such, requires large amounts of power and process steam to satisfy its operating demands.

To fulfill these requirements, it was necessary that the new Delaware City Power Station of Delaware Power & Light Company be finished to coincide with the completion of the refinery. This job — normally requiring two years — was accomplished from inception to completion in a remarkable 18 months.

The success of this project was the result of three-way close co-operation between D.P. & L., C.F. Braun, Engineers and Constructors, and General Electric's Power Plant Services Team. The latter contributed invaluable engineering and equipment-planning services which enabled Braun to design and construct the plant on an accelerated basis.

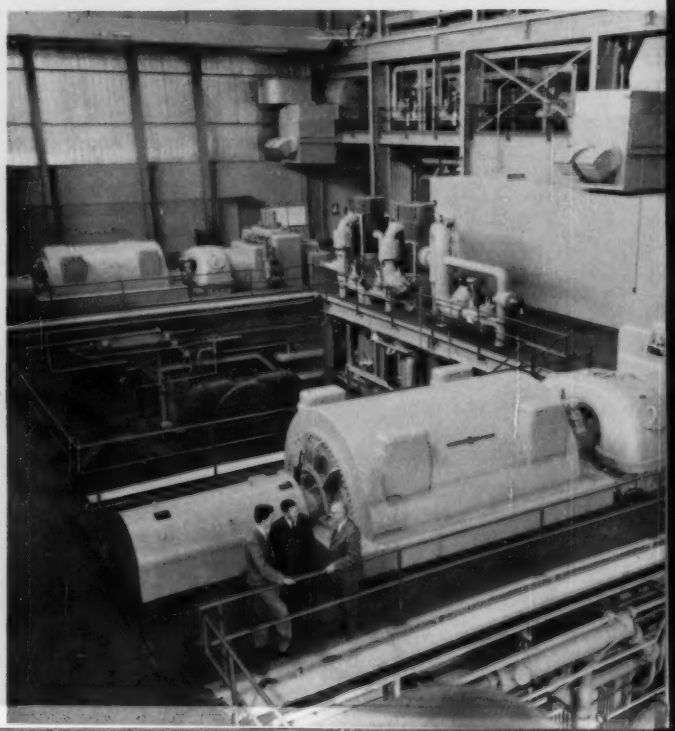
FOR MORE DATA TURN PAGE ▸

MORE POWER TO AMERICA

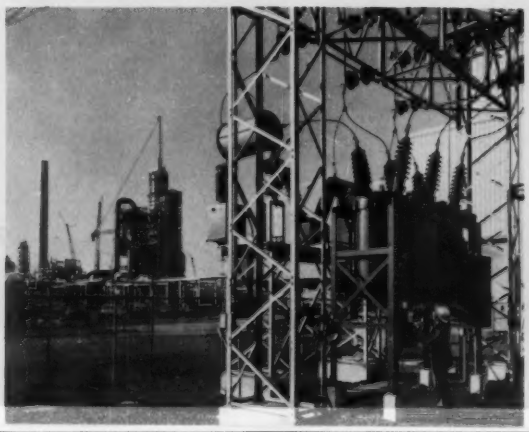
GENERAL ELECTRIC

OPERATING EFFICIENCY is boosted by functional grouping of controls and instrumentation on this modern G-E control panel. Readings can be taken rapidly and control adjustments made easily. Grouped around the console (left to right) are C. F. Braun's P. M. Terry, Resident Manager; G. C. Caine, Tidewater's Eastern Division Manufacturing Manager; General Electric Sales Engineer G. A. Eddy; Delaware Power & Light Vice-President F. T. Bear.

EXPEDITED SERVICE got turbines in service fast to operate plant auxiliaries, speed completion of station. These two General Electric 25,000 kw 3600 rpm, hydrogen-cooled units are of extraction type. Turbines are designed to operate at 1,250 psig and 950 F.



FUNCTIONAL LAYOUT of switchyard is feature of new station. Operator DiRusso checks General Electric 2500 mva, 1200 amp. circuit breakers.



Coast-to-coast teamwork co-ordinates building of all-General Electric station for D. P. & L.

Accelerated schedule successful due to close co-operation of D. P. & L., C. F. Braun and General Electric engineering team

The nature of the industrial load created by Tidewater's Delaware Flying A Refinery demands unusual service reliability and flexibility. The recently completed Delaware City Power Station incorporates these features plus facilities for future units, minimum operating manpower requirements and minimum maintenance. The plant is particularly noteworthy for its planned steam flow at 540,000 lb/hr to the refinery and heat rate of 8,700 BTU per kwhr.

However, construction of the 50,000 kw plant posed complex problems in planning. Engineering design and purchasing were done by Braun in California with Braun engineers and General Electric working in close harmony. Orders were placed with various G-E plants throughout the country and equipment was delivered to the job site in the Delaware Valley. Since none of the system components could operate until the generating units were in service, and time was at a premium, General Electric power plant service engineers worked closely on the turbine-generator construction and installation with Braun's co-ordinating, construction, and installation groups, making it possible to get the station on the line on schedule.

This application exemplifies the type of assistance you get from General Electric Power Plant Services when you specify General Electric apparatus. These services consist of product development engineering, application engineering, field service engineering, power plant co-ordination and service engineering which help to:

- **SIMPLIFY ORDERING OF EQUIPMENT**
- **CONSERVE ENGINEERING TIME**
- **INTEGRATE EQUIPMENT DESIGNS**
- **SPEED CONSTRUCTION**
- **ASSIST IN TRAINING OPERATORS**

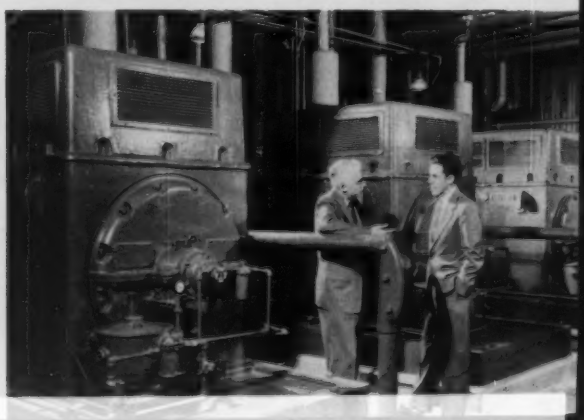
For full information on these Power Plant Services, contact your General Electric Apparatus Sales Office or write for 28-page bulletin GEA-6320 to General Electric Company, Section 302-15, Schenectady 5, N. Y.

FOR MORE DATA TURN PAGE ▸

GENERAL ELECTRIC

FULL PROTECTION is afforded by G-E 2400-v station auxiliary switchgear being examined by C. F. Parcels of D.P. & L. and G.E.'s J. J. Bradley. Switchgear controls plant and boiler feed pump motors.

REDUCED SOUND LEVEL is achieved through acoustic treatment of new 1000 hp, 2300-v G-E boiler feed pump motors. G.E.'s G. A. Eddy discusses motors with Delaware City Station Supt., R. D. Weimer.



KEY TO EFFICIENCY and economies is co-operative planning. Discussing equipment requirements of new Delaware City Power Station at Los Angeles meeting (seated, left to right): C. F. Braun's W. C. Cauthen, Project Manager; C. W. Boice, Chief Electrical Engineer; O. L. Lewis, Chief Project Engineer; and General Electric's Sales Engineer, C. C. Brown. Standing are General Electric's M. M. McGarraugh, Turbine Specialist, and F. M. Dorey, Application Engineer.

General Electric power plant service engineers expedite apparatus selection, installation, start-up

General Electric's power plant service team contributed materially to the successful planning and construction of the Delaware City Power Station in the short period of 18 months. These engineers, working in close liaison with Delaware Power & Light and Braun engineers, were of invaluable assistance in speeding up the design and selection of the best equipment for the job integrating it into station planning, expediting its manufacture and training its operators.

These functions included all of the General Electric Power Plant Services: application engineering, product development engineering, field service engineering, power plant co-ordination and service engineering. Time and money was saved and utility and consultant engineering manpower requirements were minimized.

As the trends in power station equipment continue to higher ratings, improved efficiencies, and even greater reliability, the advantage of selecting General Electric apparatus, combined with the time-saving, money-saving benefits of General Electric engineering teamwork, offers the electric utilities a striking example of why it pays to call in General Electric early when planning a new station.

LIVE BETTER ELECTRICALLY

MORE POWER TO AMERICA

GENERAL ELECTRIC

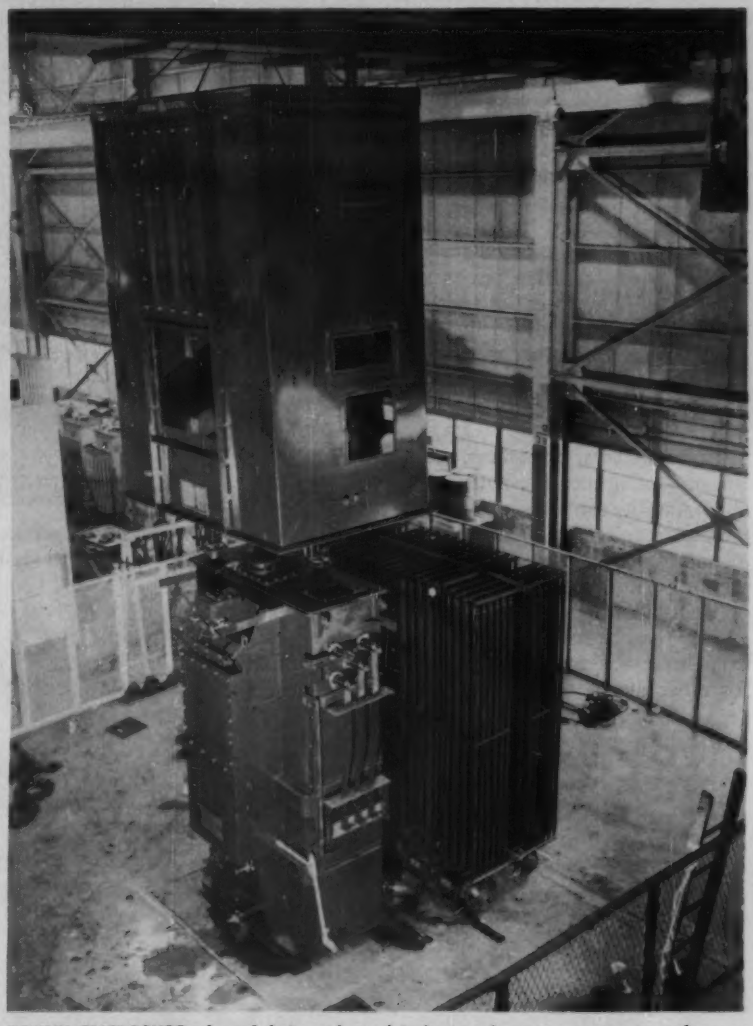
TODAY'S DESIGN TREND

Prefab Tank Cuts Noise At Substation

G. K. KALLENBACH, General Superintendent, Operations, Eastern Division, Niagara Mohawk Power Corp, Albany, N. Y.

T. F. VOLKMER, Manager-Engineering, Medium Transformer Dept., General Electric Co, Rome, Ga.

Results obtained with a test installation of a completely prefabricated steel sound enclosure for a power transformer point to possibly early commercial designs of this flexible means of bringing objectionable substation noise within tolerable limits. Additional tests will determine the scope of its application and the details needed for special sound problems.



SOUND ENCLOSURE of prefabricated steel is lowered over a power transformer. In place, it shares the transformer's concrete pad. The radiator is outside

Proved in Tests

Sound-level tests at the factory indicated that the enclosure effected a 13-db reduction, but also revealed a 17-db buildup in the inter-tank space, predominantly at 240 cycles. Glass fiber bats, installed at the substation cut this sound buildup 8 db and increased the overall sound reduction from 13 to 17 db. A few minor changes boosted silencing to 19.6 db to satisfy noise limitations of the substation site.

The designs of the transformer and enclosure were coordinated to the exacting requirements of a 5,000-kva, 34.5-kv oil-filled, load tap-changing unit substation for the Niagara Mohawk Power Corp.

Although the core-and-coil assembly was of a generally conventional design, the transformer tank was completely encased in the steel enclosure. The cooling tubes were in a separate external tube bank.

The transformer tank and the sound enclosure were mounted on a common concrete pad. Vibration isolation of these components was provided by resilient tank mounts and resilient seal assemblies where four high-voltage cover bushings, a cover-mounted pressure-relief device, and the four tank-to-tube bank oil pipes pass through the enclosure. The tube bank, mounted on an extension of the transformer's foundation pad, was isolated from the main tank by these four resilient oil pipes.

A moderate amount of internal and external bracing gives enough rigidity to the weatherproof enclosure for easy handling in factory and field. Principal accessories and the load tap-changer mechanism, grouped on the low-voltage side of the tank, were accessible through enclosure openings with hinged and bolted covers. Small glass windows make dial gauges observable. Provision was made for future special low-sound fans.

Bats Depress Buildup

Insertion of sound-absorbing glass fibre bats in the space between the main tank and the enclosure depressed the sound build-up there, accomplishing an additional reduction of sound level. This was done when the transformer was already in the field.

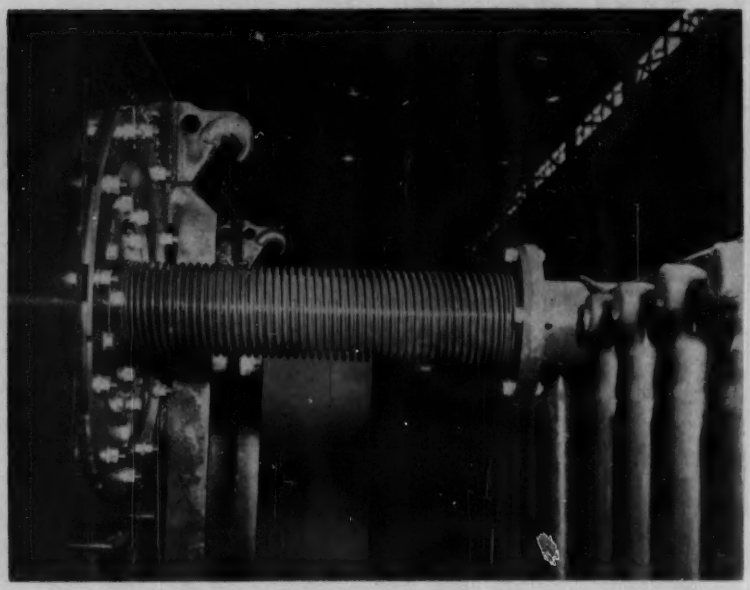
Installation time about doubled that for installing a conventional transformer, some of this extra time being attributable to the workmen's

unfamiliarity with the enclosed-type transformer and to field installation of the sound absorbents. The latter could have been inserted at the factory. More familiarity of the crew with this type of unit installation of the glass fibre bats at the factory would have cut the extra installation time an estimated 67%.

No special maintenance problems are anticipated, and repainting should be facilitated by the greater accessibility of the exposed surface. There is this limitation on its use, however; it is much easier to install in stations with overhead lines.

Compared with other methods of reducing transformer noise, this method has these advantages:

1. Bricklayers, carpenters, painters, or roofing men are not needed.
2. A utility can specify sound and thermal requirements and hold the manufacturer entirely responsible for the performance.
3. Installation time, although longer than for the conventional transformer, is much shorter than for other means of obtaining large sound reductions.
4. When load growth or other factors necessitate removal of a transformer, its relocation is easier.
5. A minimum of enclosure material is used, as only the transformer is enclosed.
6. Maintenance is simplified over other types of installation for equivalent sound reduction.
7. It is easily used with overhead connections.



RESILIENT OIL PIPE isolates radiator from transformer. Use of four of them to an installation prevents the communication of transformer vibration to radiator

TRANSMISSION—Construction

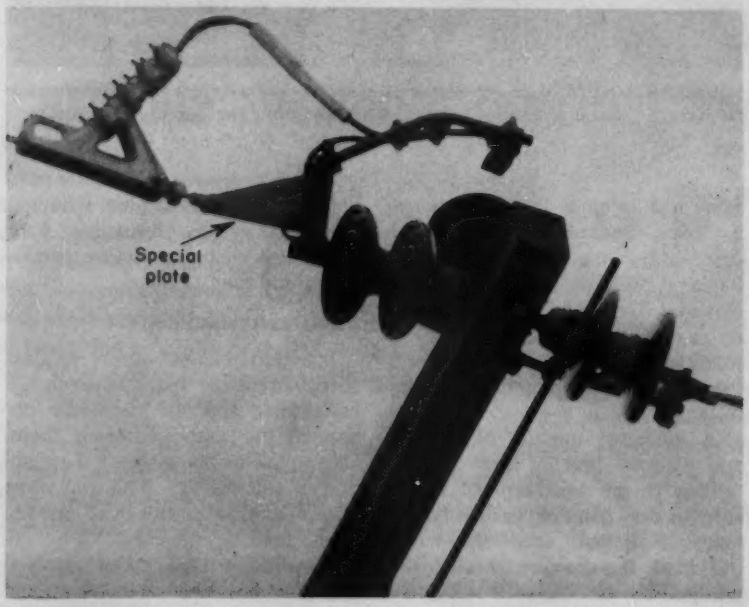
Strain Plate Adapts Switches to Al Wire

ROBERT F. WHITLOW, Line Crew Foreman, Dept of Lighting, Seattle, Wash.

Special strain plates permit conversion of rotating-type airbreak switches in 26-kv lines from copper to aluminum. The plates eliminate supplementary deadending of the aluminum conductor or replacement of the 400-amp switches, which will not take the aluminum conductor.

A set of two plates, built for nominal cost, save about $2,000 in construction and material costs per switch position. One end of the triangular plate bolts to the switch; the other has a shackle bolt which attaches to a deadend clamp.

(More How To on page 92)



STRAINPLATE bolted to an air-break switch on a 26-kv copper-conductor line provides a point of attachment for a dead-end clamp holding an aluminum conductor

Silent...and completely filled

General Electric capacitors don't gurgle because they are filled to the very tops of the bushings. Tip one and listen; test one with a stethoscope; or just tap it with a coin. You can double-check by looking into the glass bushings.

Why such tests? Because air bubbles in a capacitor can do more than gurgle. They can cause internal flash-over and failure. Even if the unit is mounted upright, you can't be sure a bubble hasn't been trapped in the winding to cause subsequent trouble.

No air gets in G-E capacitors because, after each unit is completely filled with Pyranol* under a vacuum pressure, the fill-hole is sealed under Pyranol. Result: no voids, no air channels, no weak spots where failure can start.

This is another of the Engineered Extras you get with G-E capacitors. Ask your General Electric Apparatus Sales Engineer to tell you more. Or write to General Electric, Section 445-5, Schenectady 5, New York.

*Reg. Trade-mark of General Electric Co.

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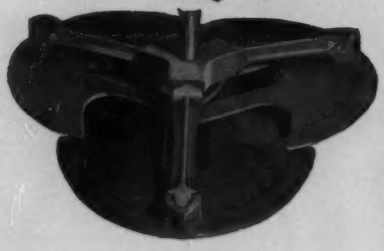
The Old Reliable

EVERSTICK ANCHORS...

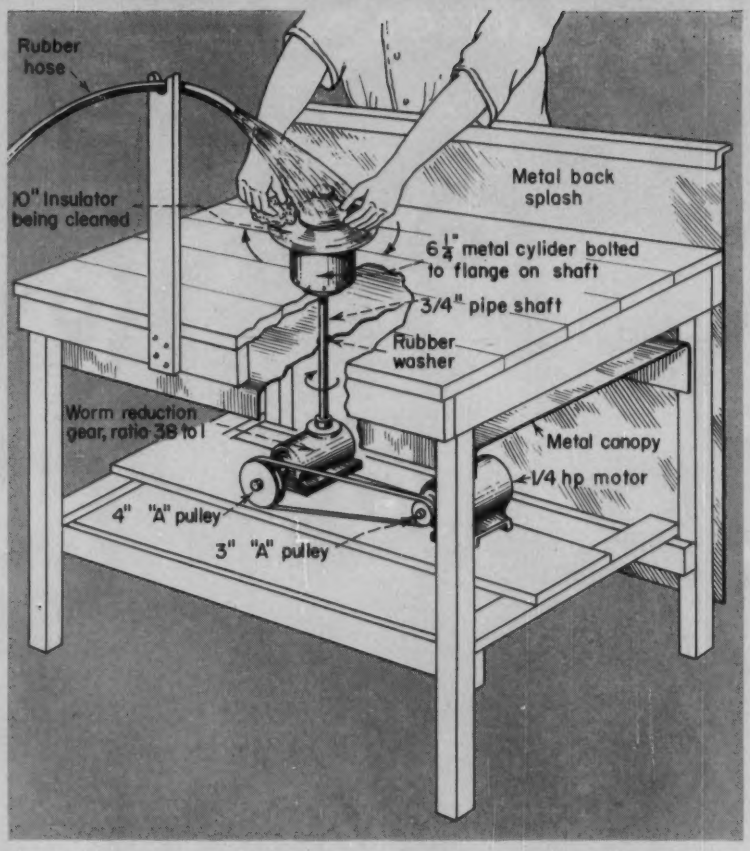
EXTRA Holding Power
QUICKLY Installed
TOUGH For long life



● They speed up work and provide dependable anchorage in new construction and maintenance. Quick and easy to install—made of tough rust-resistant malleable iron—their holding power "tops" all other. Available two-way, three-way, four-way, and cone types. Write for facts.

AN EXCLUSIVE EVERSTICK FEATURE
Exclusive Everstick nut housing Locks anchor firmly on rod. No chance of rod slipping thru anchor.

EVERSTICK ANCHOR CO
FAIRFIELD, IOWA



Rig Cuts Time For Washing Insulators

J. W. EVANS, District Station Foreman,

J. K. JARRELL, Stationman A, Appalachian Electric Power Co, Huntington, W. Va.

A rig for eliminating the slow and tedious hand work in washing strain insulators has been devised in this division of the Appalachian Electric Power Co. The rig rotates any strain insulator at about 38 rpm (either side up) under the trickle from a hose while the operator holds steel wool against the porcelain and a wire brush against the hardware.

Deposits on the strain insulators of four 33-kv lines passing a chemical plant in Huntington gradually increase to the stage where flashover or damage may occur. When the hazard arises the dirty insulators are replaced and brought into the reclamation shop in truck-load lots for cleaning and painting of the hardware.

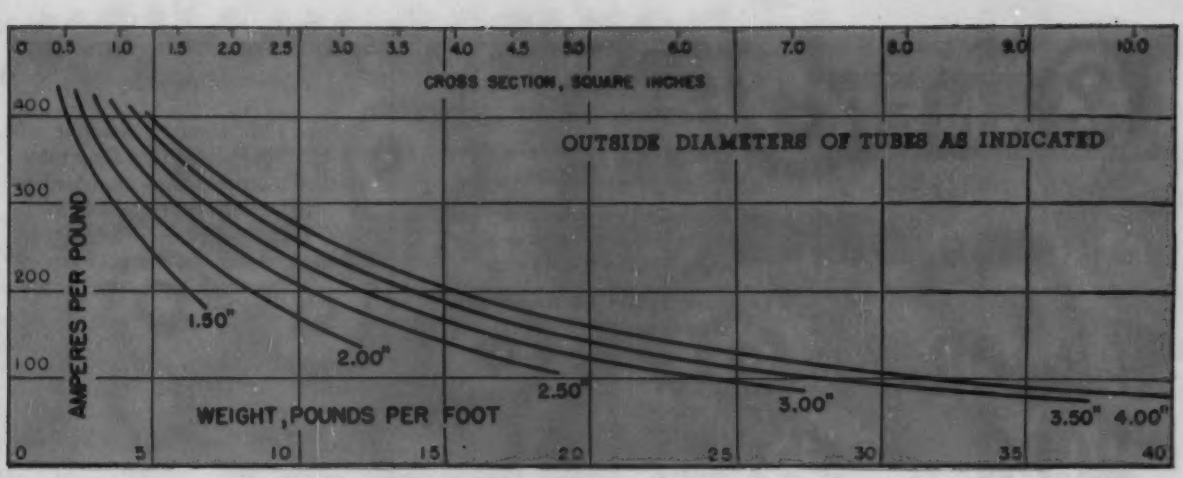
Boiling insulators in Oakite #24 for 30 min loosens the deposit, but its removal takes scrubbing. Before being scrubbed, the insulators are boiled ½ hr in a 48 x 48-in. vat and then it is rinsed in warm water.

When one side is scrubbed, the insulator is turned over on the rig's rotating mount and the other side is cleaned.

This rig is economically justified wherever more than 50 disk insulators have to be cleaned, as hand cleaning that number is not economical. With this improved procedure, strain insulators may be cleaned in 2 to 3 min each, compared with 6 to 8 min by the old hand method. Furthermore, wear and tear on the washer's hands has been reduced to the point where "breaks" to rest them are now both much fewer and shorter.

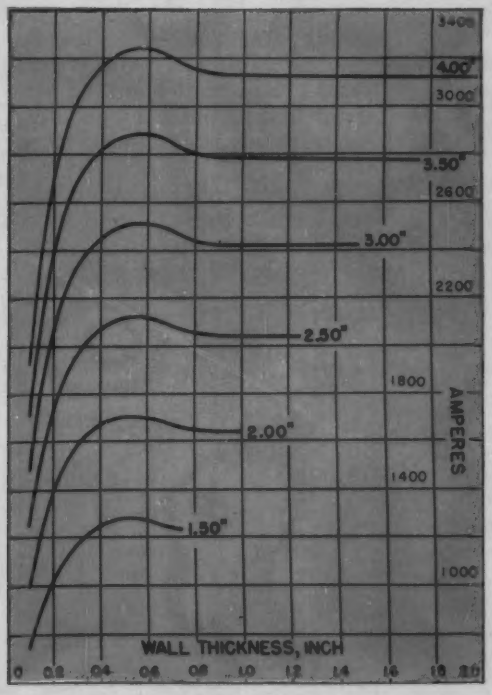
The power rig was assembled from parts normally found around

(Continued on page 94)



60-CYCLE CURRENT ratings of six round copper tubes in terms of weight per foot.

How to carry more amperes per pound of copper



THE INFLUENCE of wall thickness on the 60-cycle current rating of six round copper tubes.

THIN-WALL TUBES with low wall-thickness-to-diameter ratio offer decided electrical advantages—and opportunities for cutting bus costs—wherever mechanical requirements permit. The charts above and at the left show the 60-cycle skin-effect phenomenon characteristic of six representative sizes of round copper tube, 1.5" to 4.0" O.D. The curves cover the entire range of wall thickness from solid round rods, at the right, to the thin-walled tubes in common use at the left. What is true of round tubes is also true of other tubular bus shapes.

INSTALLATION ECONOMIES. When round tubular bus conductors can be selected in thin-wall sizes from the standard pipe dimension schedules, it is possible to effect further economies by the use of stock sizes of supports, connectors, tap clamps, and other necessary hardware available in great variety in dealers' stocks.

More complete information on tubular conductors is available in the Sixth Edition of The American Brass Company's Publication C-25. This 62-page booklet has a wealth of general information on the properties of copper conductors—plus convenient data for the most commonly used sizes of all types of rigid bus conductors.

TECHNICAL SERVICES. Anaconda specialists are available to help you in the solution of technical problems involving the use of Anaconda Bus Conductors. For such service, or for a copy of Publication C-25, see your nearby Anaconda representative. Or write: The American Brass Company, Waterbury 20, Conn. 87180

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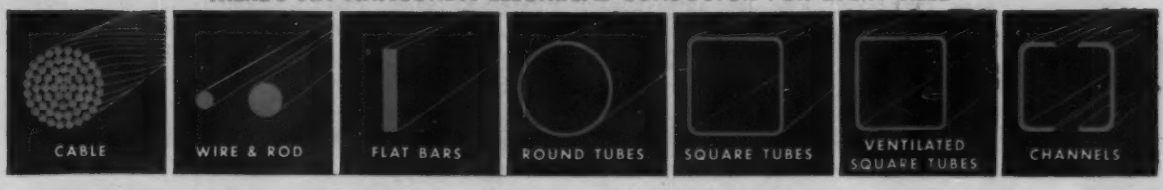
Made by The American Brass Company

THERE'S AN ANACONDA ELECTRICAL CONDUCTOR FOR EVERY NEED



FANNER

Superformed ARMOR RODS do SO MUCH for SO LITTLE

- Have low installed cost.
- May be removed and reapplied without loss.
- Provide effective armoring with easy application.
- Eliminate field fabrication and the improper twisting or tightening of field-formed rods.
- Have built-in full length gripping power to share conductor strain under excessive loading conditions.
- Serve as an excellent conductor repair medium (for broken wires).
- Eliminate trouble caused by loosened end-clamps.
- Eliminate conductor wear in insulator grooves or in suspension clamps.
- Adapt easily to hot-line application.
- Permit direct tapping and eliminate conductor damage due to burning, over-tightening, or clamp loosening.
- Eliminate conductor pitting due to power currents attending flash-overs.
- Minimize corona formation, by eliminating irregularly shaped clamps or clips.

A FANNER EXCLUSIVE:

Packed in sturdy cartons. Armor Rod ends are color coded for easy identification of sizes up through 4/0. Write for convenient color code chart.

Licensed for use under patent No. 2,275,019

THE FANNER MANUFACTURING COMPANY

Electrical Products Division

BROOKSIDE PARK • *Established 1894* • CLEVELAND 9, OHIO

Telephone: SHadyside 1-6000

Fine Fanner Superformed

AGENTS and DISTRIBUTORS IN PRINCIPAL CITIES

Lineguards • Top Armor • Patch Rods • Fanngrips • Plastic Fannguards

Speeds Insulator Washing

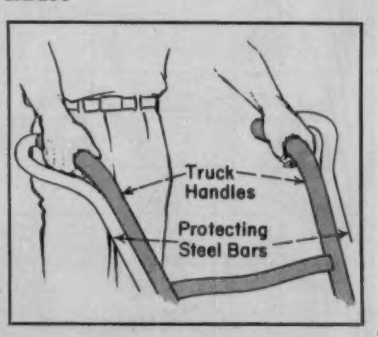
(Continued on page 92)

a shop with about 2 man-hr of labor. Under a standard shop table installed outdoors was mounted a 38:1 reduction gear belted to a 1,750-rpm, ¼-hp motor. Attached to the slow shaft of the gear box is a ¾-in. vertical pipe with a top flange whose hub serves as steady bearing in the table top and carries the insulator mount. The latter is a 6-in. cylinder whose upper edge is covered by a split section of hose that provides a non-slip contact with either the top or bottom of a 10-in. insulator disk. The trickle from the hose runs off the table top onto the ground.

Any water leaking through the table top is deflected from the motor and reduction gear by the metal canopy. The hole in the canopy through which the vertical shaft passes was peaned upward and protected from drainage by an overlapping rubber washer snugly fitting the shaft.

The operator is shielded by the metal splash barrier.

SAFETY



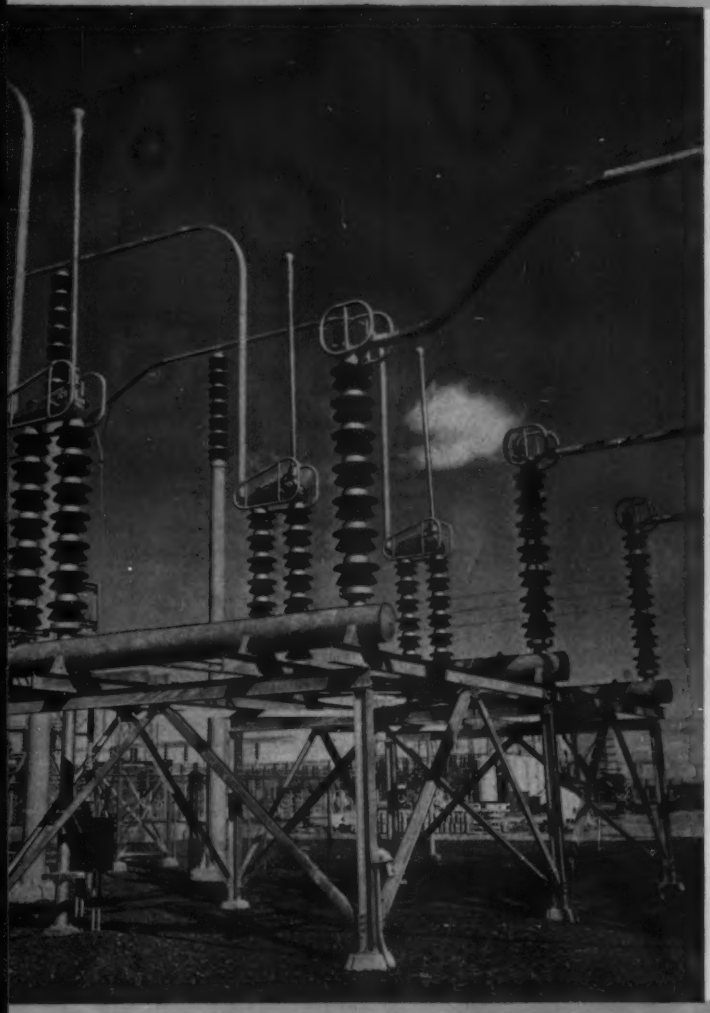
Guards on Hand Trucks Prevent Finger Injuries

A simple guard for hand trucks prevents injuries to knuckles and fingers when trucks are moved in limited-space areas. In use by the New England Electric System, the guard is a flame-shaped, ⅜-in. round steel bar bolted to the outer side of the truck handles. Operator's hands are inside these protective guards.

Credit for this idea goes to R. L. Ruggiero, Worcester County Electric Co.

NOW IN SERVICE...

FEDERAL PACIFIC'S 345-KV AIR SWITCHES



Features of the TG Switch Line:

- High momentary current ratings
- Minimum number of current interchange points.
- High pressure duplex contact shoes
- Weather resistant housing
- Rigid base construction
- Solid-silver inserts—non-galling contact
- Dependable floating shoe construction
- Simplified linkage and anti-friction bearings
- Available in voltage ratings from 7.5 to 440 kv.

Part of the TG-4 345 kv Switch Installation on the McNary-Ross Line of the Bonneville Power Administration.

Federal Pacific TG-4 air switches are among the first to go into service in the United States at 345 kv. Currently in operation at the Umatilla, Oregon, end of the 175 McNary-Ross line which supplies power for the city of Portland, Oregon...these switches have a 1,300-kv B.I.L., 1,600-amp continuous current, and a momentary rating of 70,000 amperes.

Keeping pace with the ever-accelerating trend toward higher and higher voltages, Federal Pacific is ready to help you with *your* extra high voltage problems—now!

For further information call your nearby Federal Pacific representative, or write to the Pacific Switchgear Division, 5815 Third St., San Francisco 24, California, for Catalog 4-129.

Finest Products Engineered

FEDERAL PACIFIC ELECTRIC

COMPANY

Main Office: 50 Paris Street, Newark 1, N. J.

Plants at Newark, N. J.; Long Island City, N. Y.; Cleveland, Ohio; St. Louis, Mo.; Dallas County, Texas; Scranton, Pa.; Los Angeles, Calif.; San Francisco, Calif.; Santa Clara, Calif.; Emeryville, Calif.; Affiliated Plant, Toronto, Canada.

The 'All-Electric' Home: PGE Tells How to Promote It Successfully

Portland General Electric used a well-built house, backed it with solid, controlled promotion, and even had an electric eye to count the crowd

ROLLIE GABEL, Promotion Coordinator, Portland General Electric Co, Portland, Ore.

In winning national first place honors for the promotion of an all-electric home, Portland General Electric Co developed a successful formula for demonstrating to Portland homeowners the advantages of living better electrically. PGE sponsored the home with Living for Young Homemakers magazine.

We followed four fundamental precepts:

1. Most important, we worked with a well designed, well built, well insulated home.

2. We had a positive, go-all-the-way promotion and advertising attitude.

3. We kept in close touch with our sales and publicity departments.

4. We controlled completely all advertising and promotional activities. The builder and suppliers were concerned strictly with the physical features of the home.

These four points were the hooks on which we hung the promotion. As a result, some 30,000 people toured the model home in four weeks.

Kept Everybody Informed

From the outset we made certain that all contractors and suppliers knew what we were doing to promote the home. We held a meeting with our ad agency, the builder, the contractor and the suppliers at which we laid out our plans and invited the others to tie-in.

Prior to the formal opening of the home, we held another briefing for the builder, architect and seller. Salesmen from the seller's firm were assigned to staff the home during the showing to answer visitors' questions. We gave them material to study to familiarize themselves with the home's features, and sent our own sales people to help.

Two "sneak" previews were held on two separate days. One was for PGE executives and building and city officials; the other was for the press. Press representatives received a press kit describing the home's important features. Both Portland metropolitan papers ran a record amount of lineage, and one of them featured the home on the cover of its home and garden section.

A continuing series of ads ran through the four weeks the home was open. These were all in the classified pages. Every Sunday, a mobile unit from a local radio station interviewed visitors and broadcast their reactions.

Each person visiting the home was given a brochure about it. Despite bad weather, almost 5,000 people made the tour on opening day. Even counting them was done electrically . . . by an electric eye!

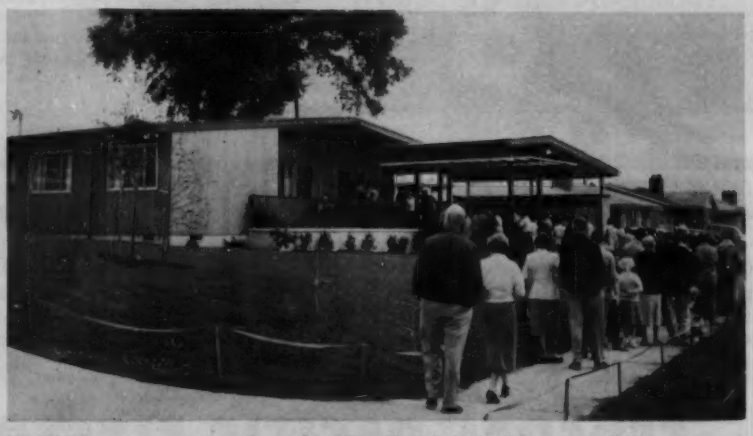
From our viewpoint, the opening and home were a tremendous success. More than 30,000 people witnessed the wonders of living better electrically. They found out what HOUSEPOWER is. The home has 400-amp service, 35 circuits, and more than 150 outlets.

Almost one-sixth of our area's total population used the home's intercommunication system, saw good lighting demonstrated, toured an electric "dream" kitchen, and enjoyed electric heat.

In promoting the home, PGE's premise was to present to visitors a houseful of electrical ideas which they could use in their own homes. The brochure, previously mentioned, explained that the ideas built into the Electri-Living home were theirs "whether they were building, buying, or modernizing."

We've had an exact scale model of the home made and incorporated into a display currently being shown at fairs, home shows and expositions. The original brochure has been re-done, and is distributed to interested customers.

(More Selling on page 98)



VISITORS queue up to go through PGE's 'Electric-Living' home. Solidly promoted, the home had 30,000 people go through it in the four weeks it was open

Get 3 Tanks (A Tank Per Phase)

Even on Outdoor Distribution Breakers

Don't be 1/3 Safe!

● Be completely safe! Buy breakers that offer positive protection for today's low reactance systems with their corresponding high fault currents. Three tanks, not just one, provide maximum protection.

Enjoy this big breaker type protection in outdoor distribution breakers at no extra charge. Other big breaker features include: AEIC-NEMA standardized control wiring; two vertical breaks per phase, using time-tested *Ruptor* devices; self-aligning, self-wiping tulip and bayonet contacts.

Ask for Bulletin 71B7946 for the complete story. Contact your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Ratings: 14.4 kv, 100 and 250 mva

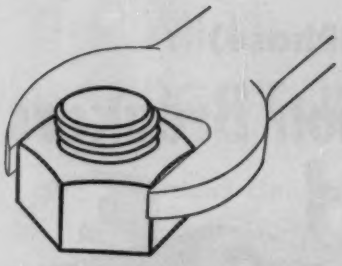
Ruptor is an Allis-Chalmers trademark.

ALLIS-CHALMERS

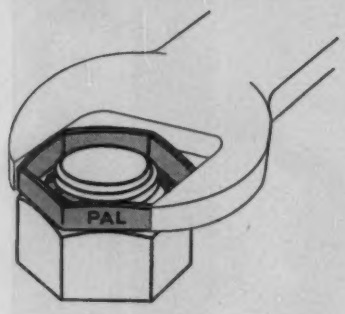
A-C ALLIS CHALMERS

A-5146

Get it tight —



then KEEP it tight



with a

PALNUT LOCK NUT

JUST spin on a PALNUT Lock Nut and lock with 1/3 turn of a wrench. Takes but seconds, cost is negligible, protects for the life of the installation. PALNUT Lock Nuts exert a double locking action that prevents the plain nut from loosening and the bolt from backing out, under severest vibration. Eliminates further checking or re-tightening on mechanical assemblies —maintains perfect conductivity on electrical connections.

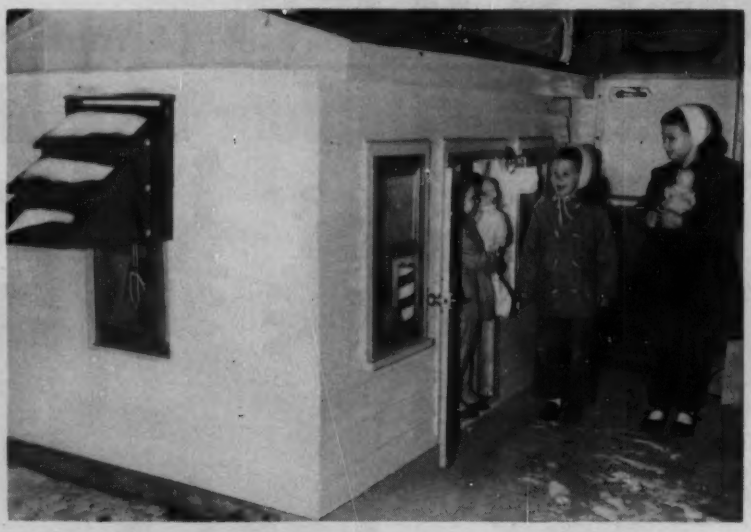
Widely Used Thruout Utility Field

PALNUT Lock Nuts have been used for years on wood poles, steel towers, fittings, connectors, switches, hardware, transformers, etc. Complete range of sizes, in all finishes and materials used by utility industry. Get Bulletin #577.

THE PALNUT COMPANY

51 Glen Road
Mountainside, N. J.

PALNUT
TRADE MARK
LOCK NUTS
for quick, secure fastening at low cost



Dollhouse Promotes Electric Heating

Debbie and Sue Vought of Ravenswood, W. Va., proudly show their all-electric dollhouse to a friend, center. The house was built by Mr. Vought, who is in the business of selling electric home heating. It has not only been popular with the kids, but has aroused a lot of local interest.

Connected to Appalachian Electric Power Co's lines, it features electric heating (with its own thermostat!), a miniature electric range, recessed lighting, and an electric doorbell. Ceiling, walls and floor are insulated to meet the same standards recommended for new home construction. It also has storm windows and aluminum awnings.

Vought says he will make the dollhouses to order, and is looking for other ways to use this one to promote electric heating. Possibilities include parades, window displays and advertising.

H & C BRIEFS

'Carry-Home' Air Conditioner

A room air conditioner, small enough to be carried home by and installed by the customer has been introduced by Philco Corp. The "Bantam 12" comes in a carton already equipped with handles. According to Philco, it requires a simple 3-step installation procedure.

Westinghouse Wall Heaters

Westinghouse Electric Co has redesigned its line of wall electric home heaters to fit under today's lower windows. Heaters in the 1-kw to 6-kw range are cut 2 in. in height and ½ in. in grill width.

NYC Becoming Air Conditioned?

New York City, the "big building capital" is leading the nation toward completely air conditioned cities, according to a survey recently released by Carrier Corp. Since the end of World War II, some 71 multi-story buildings providing 22.8 mililon sq ft of air conditioned space have been built in Manhattan, totalling 110,000 tons. Twenty-four existing buildings have made air conditioning installations. In addition, 20 other new buildings involving about 10 million sq ft of A.C. space are on the boards.

(More Selling on page 100)

Wire Sculpture by Henry Szafarz

It's Another World . . .

one in which the forces of nature are extremely rough on man-made things. Thus, the simple fact that Simplex supplies more submarine cable than all other manufacturers combined speaks volumes as to product quality. Simplex Submarine Cables are specifically engineered for reliable underwater communication and power transmission. Their many varieties of outer coverings, wire armor, heavy jackets of Neoprene and other materials, guard against underwater hazards and assure long, dependable service.

SIMPLEX WIRE & CABLE CO.,
79 Sidney Street,
Cambridge 39, Mass.

Photo of Transoceanic Telephone Cable, Cut Back to Show Construction

LIVE BETTER ELECTRICALLY

Simplex

Panel only half as big . . .

replacing 40-year old, open front board . . .

Ends Power Interruptions, Doubles Capacity

C. R. E. MURPHY, Industrial Power Sales Engineer, Baltimore Gas & Electric Co, Baltimore, Md

A new, metal-clad distribution panel recently installed at the Hendler Creamery Co, Baltimore, Md., has eliminated power interruptions, doubled plant capacity, and halved space requirements. With all switches, contact points, circuit breakers and wiring totally enclosed, personnel working near the equipment enjoy the advantage of complete safety.

"Since the new electric panel went into service, we haven't had a bit of difficulty; in fact, it seems to have spruced up the operating efficiency of our entire plant," says Carl Railey, Hendler's chief engineer. "Our old equipment had seen continuous service since the middle 'teens and not a week went by that it didn't cause trouble."

The previous panel was a 40-year-old, live-front board. Despite all efforts to keep it operative, the board failed repeatedly because of its age. Equipment behind the panel was in bad condition. Some breakers were inoperative and could not be repaired because replacement parts had long been out of manufacture.

Contact areas on the knife switches had become pitted and corroded. Bolts holding the gear in place were so brittle that they sometimes sheared off when tightened. Electric load on the board had to be reduced to far below rated capacity.

Planning Keys Output Rise

R. HEGEL, Industrial Sales Engineer, Connecticut Light & Power Co, Waterbury, Conn.

Planned lighting in a new inspection room paid off in increased output and higher employee morale at Winsted Precision Bearing Co, Winsted, Conn. ball bearing maker. High intensity fluorescent lamps mounted on the tables produce the high level lighting needed for a microscopic inspection. Two-lamp louvered fixtures with an upward component assure adequate illumination for ordinary work. Light colored walls and acoustical ceilings help hold the contrast between table lighting and overall lighting to about 5:1. The design makes possible higher output per worker without sacrificing quality or causing eyestrain.

you will be on safe ground with . . . . . .

WEAVER
GROUNDING DEVICES

Economical prices—ease of installation—trouble-free service . . . all yours with Weaver grounding devices!

GROUND RODS AND CLAMPS
They're designed for each other! RODS are completely copper armored . . . safe from corrosion. Rigid steel core and sharp point make driving easy. The CLAMPS grip firmly . . . hold connections under extreme pressure permanently. Rounded screw point prevents rod damage.

POLE BOTTOM GROUND PLATES
. . . have 25% larger copper area than other commonly used plates. That means: greater conductivity—better overload dispersal. Solderless connector with vibration-proof lock washer assures high pressure contact that stays tight for keeps.

GROUND CLAMPS (UL APPROVED)
Cast in bronze for complete resistance to rust and corrosion. They're easy to use and make permanent ground connections. The only complete line of bronze clamps for ¼" to 4" pipe. Competitively priced.

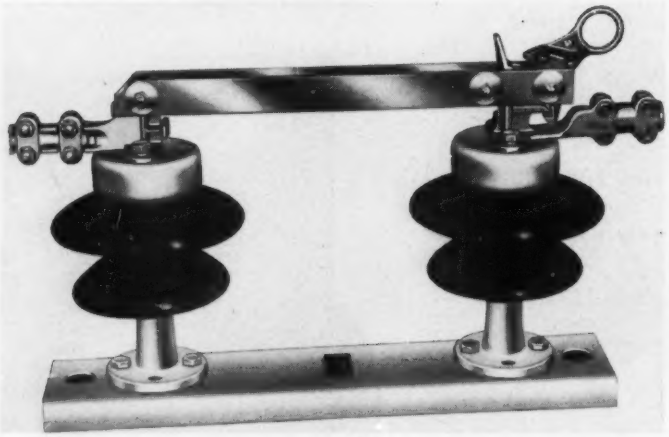
WRITE TODAY FOR SAMPLES AND CATALOG

J. A. WEAVER Company

2110 HOWARD ST. · ST. LOUIS 6, MO.

Telephone CEntral 1-8100

NEW EQUIPMENT



Disconnect Switch

The Type PHM hookstick operated distribution disconnect switch is offered for 7.5, 15, and 23 kv with continuous current ratings of 200 and 400 amp. Reported features include high pressure line contacts, positive blade latch when closed, parallel blade construction, and integral terminals. It is available with steel channel or rolled flange bases.

A tandem transfer switch, the Type PHMT, with similar features and ratings, is also available.

Southern States Equipment Corp, Hampton, Georgia.

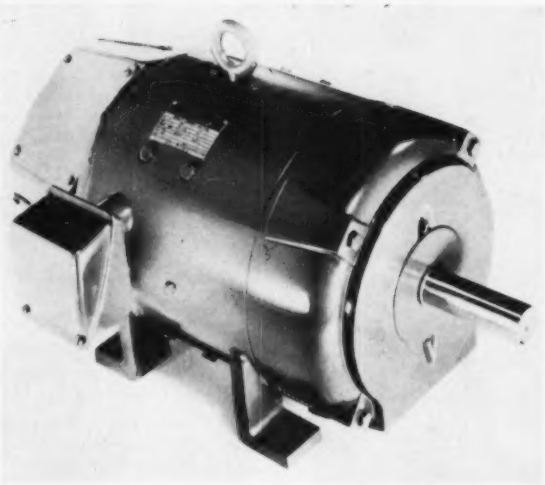
D-C Motors, Generators

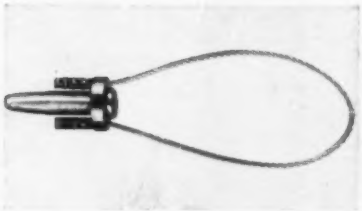
This line of d-c industrial motors and generators, designated as the Life-Line "H" series, includes motors from 1 to 150 hp and generator ratings from ¾ to 100 kw. Although rated for Class B operation, they use silicone insulation which reportedly has 10 times the life of conventional Class B.

Manufacturer claims dynamic response exceeds that of similar standard lines, with armature inertia cut as much as 55% and commutating ability boosted 35%. One-minute current is rated 200%. Controlled positive flow ventilation draws air from the shaft end to keep commutator dust off the windings.

Drip-proof enclosures are standard. Bracket ventilation openings flanged for duct connections. The "H" series is said to be useful as prime movers or elements of automatic production.

Westinghouse Electric Corp, P. O. Box 2278, Pittsburgh 30, Pa.





Deadend

Available in 12 sizes for conductors from No. 8 to 250 Mcm, the series D automatic deadend is said to cut installation time on spool terminations. Yoke is high strength cast bronze. Bail wire has stainless steel ferrules compressed on ends, with one end held captive in the yoke. Other end can be removed, looped around spool, and then reinserted in the yoke. A bubble on the shell of the gripping unit holds bail in yoke.

The gripping unit has a smooth internal sleeve which reportedly eliminates snagging and catching of wire strands. Gripping jaw is a one-piece, machined unit. Sizes D-4 and D-6 use high strength bronze bail wire. All other sizes have stainless steel. Units may be obtained with heavy neoprene tubing over bail wire (D-N series).

Fargo Mfg Co, Poughkeepsie, N. Y.

Thermostatic Switch

A thermostatic switch with fiberglass sun and rain shield is reported to automatically connect small residential capacitors to handle heavy air conditioning loads in hot weather. For use on units rated 3 kvar and 5 kvar, the unit is said to switch capacitors in at approximately 85F and out at approximately 75F.

General Electric Co, Schenectady 5, N. Y.

Insulating Tape

This varnished polyester web tape, known as Fibremat, is available for wrapping field coils, phase insulation in motors, or as an insulating material for generators, transformers, cables, and splices. It is said to be a Class A insulation material with a dielectric strength of 1,650 v per mil, an elongation of

(Continued on page 104)

At large L. I. housing project — LILCO workman fastens triplex cable to pole. Neoprene keeps cables on the job because it resists abrasion caused by falling branches, won't crack in heat or cold and all but eliminates dampness and corrosion problems. (The two neoprene-covered phase conductors are shown in red.)

To meet increased service needs—

Long Island Lighting Co. chooses triplex cable jacketed with NEOPRENE

More than 1,600,000 people depend on LILCO for power and lighting—and the area's expanding fast. One new shopping center alone will require 22,000 KVA in connected transformer capacity.

But LILCO is keeping pace, with cable jacketed with neoprene—Du Pont's synthetic rubber. Practically all new secondary overheads, for example, are triplex cables (two neoprene-covered phase conductors twisted around a bare neutral cable). They give greater resistance to corrosion and abrasion—cut maintenance to a minimum.

Neoprene goes underground, too. Already about 1,000 miles of neoprene-jacketed secondary and street-lighting cable are underground, and LILCO is steadily adding to the total. They've installed 345 miles of neoprene-covered primary cable since 1952 and specify neoprene jackets on all new underground primaries.

LILCO reports 10-year excellent service records for neoprene-jacketed secondary cable underground — not one case of failure due to corrosion, electrolytic or ozone attack!

You can be sure your cable will have the same long-term protection when you specify jacketing of neoprene, Du Pont's synthetic rubber. Neoprene resists sunlight, weathering and temperature extremes on overhead installations; oil, grease, electrolytic attack in conduits; soil acids when buried direct in earth. Your maintenance costs stay low with neoprene-jacketed cable—so ask your distributor about it next time you order.

MAIL THIS COUPON TODAY!

NEOPRENE

The rubber made by Du Pont since 1932

DU PONT

REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING...THROUGH CHEMISTRY

FREE! THE ELASTOMERS NOTEBOOK. Read how neoprene's resistance to all sources of deterioration cuts maintenance costs on products old and new. Actual on-the-job reports are featured in every issue. Clip coupon to get on mailing list.

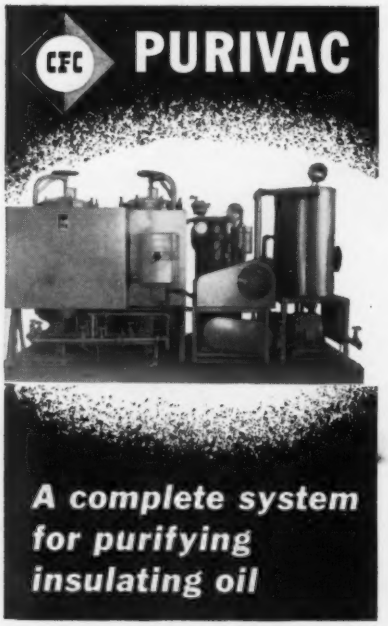
E. I. du Pont de Nemours & Co. (Inc.),
Elastomer Chemicals Dept. EW-4,
Wilmington 98, Delaware

*Name*_____ *Position*_____

*Firm*_____

*Address*_____

*City*_____ *State*_____



The CFC Purivac is a *complete system* for purifying, dehydrating and degasifying insulating oil. It operates either at a central reclaiming station or in the field while electrical equipment is in service. With Purivac, you extend the useful life of oil indefinitely.

Purivac prevents formation of sludge deposits that cause overheating and burn-outs along sludged surfaces; eliminates costly system cleanouts; reduces corrosion and deterioration of fabric insulation; cuts electric losses by keeping power-factor percentages and operating temperatures low; restores interfacial tension and dielectric strength.

A Commercial Filters engineer will be glad to demonstrate the advantages of Purivac. Write for technical literature to Department EW.

COMMERCIAL FILTERS
CORPORATION
MELROSE 76, MASSACHUSETTS

Plants in Melrose, Massachusetts and Lebanon, Indiana

Insulating Tape

(Continued from page 102)

20%, a power factor of 0.02, and a water absorption rate of 0.5% after 24-hr immersion.

Manufacturer claims this material has higher conformability than conventional coated insulations and can be pulled down tightly while wrapping.

Irvington Div, Minnesota Mining & Mfg Co, Irvington, N. J.

Trough Clamp Bracket

A clamp bracket which attaches to a cable trough section or fitting is available for supporting cable, conduit or piping crossing the side of the trough. It can be used with all standard conduit clamps and is secured by a bolt-type connector. Manufacturer claims it is useful where a combination of cable and trough are used in modernizing or expanding a system.

T. J. Cope, Inc, Collegeville, Pa.

Mobile Power Supply

This self-contained a-c power supply, comprising a 3-kva alternator, a pre-set, finger-type regulator, and an encapsulated field excitation rectifier, is intended to supply heating, lighting, or other non-frequency responsive loads in construction vehicles, maintenance equipment or similar applications.

The alternator can be belt-coupled to any rotating shaft and has an automobile-type three point mounting for easier installation and belt adjustment. It can be used at speed up to 10,500 rpm. The regulator is said to hold voltage within ±3% from no load to full load and from minimum to maximum alternator speeds.

The moisture-resistant rectifier has brackets for ease in mounting. Rectifiers for powering hand tools using series universal motors are also available.

General Electric Co, Schenectady 5, N. Y.

Industrial Switch

The Type HD heavy duty switch is intended for industrial use and includes the gasketed industrial (NEMA 12) type, the water-tight and dust-tight type, and the explosion-resisting type. Available for either 250 or 600 v, ac or dc, its ratings extend from 30 to 600 amp. It has interchangeable lugs and heavy, electroplated silver on all current parts. The quick-make, quick-break operating mechanism is independent of the handle. Both NEC and dual element fuse ratings are available.

Similar existing light duty and normal duty switches have been rerated as Type LD and Type ND respectively.

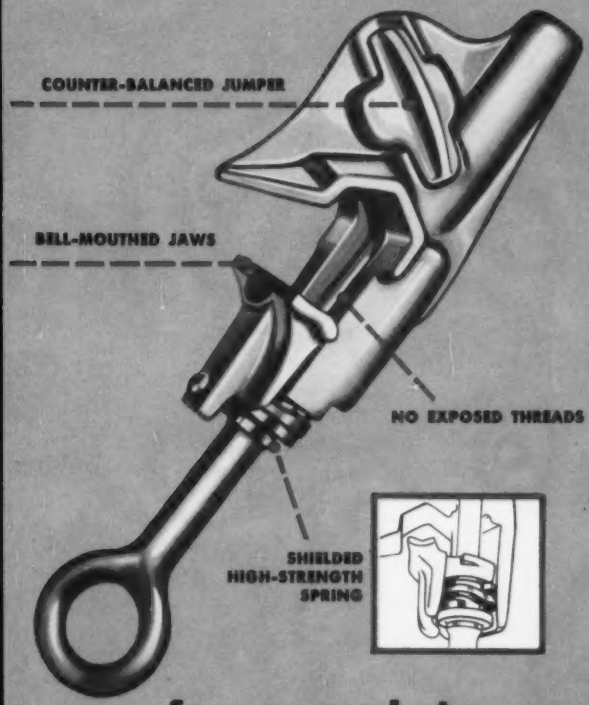
Square D Co, 6060 Rivard St., Detroit 11, Mich.

Service Entrance

Aluminum alloy Swing-Top service entrance has hinged cap that swings, hangs aside during installation of wires. Threading and conduit bending are eliminated. It attaches to rigid conduit or EMT with a sturdy pressure clamp.

Electrical Fittings Corp, 37-50 57th St, Woodside 77, N. Y.

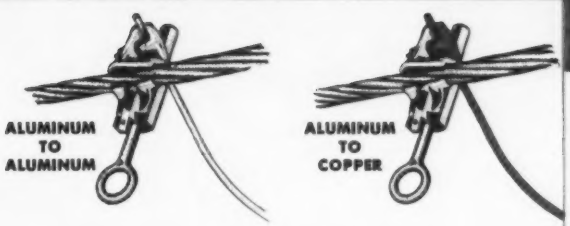
(More New Equipment on page 109)



for complete

- **Conductor protection**
- **Contact protection**
- **Thread protection**

CHANCE PC CLAMPS



One AGP* Clamp can be used in all these combinations

Chance AGP Clamps, approved by power company after power company on the basis of their own tests, can be used for all types of connections: aluminum to aluminum, aluminum to copper, copper to aluminum, and copper to copper. They have the advantage of light weight which lengthens conductor life by minimizing the effects of vibration and makes them easy to handle with a clamp stick . . . plus easy identification by their distinctive appearance—plus their most important feature: Versatility. Available in both the "Protected Connection" and "Perma-Grip" types shown on this page.

***CHANCE Aluminum General Purpose**

When specifying clamps or connectors choose the design that will

PROTECT Your CONDUCTOR!

D. C. HUBBARD, Chief Engineer, Conductor Specialties, A. B. Chance Co., says: "In choosing clamps or connectors, remember that they can protect—or damage—the most important part of your circuit . . . the conductor.

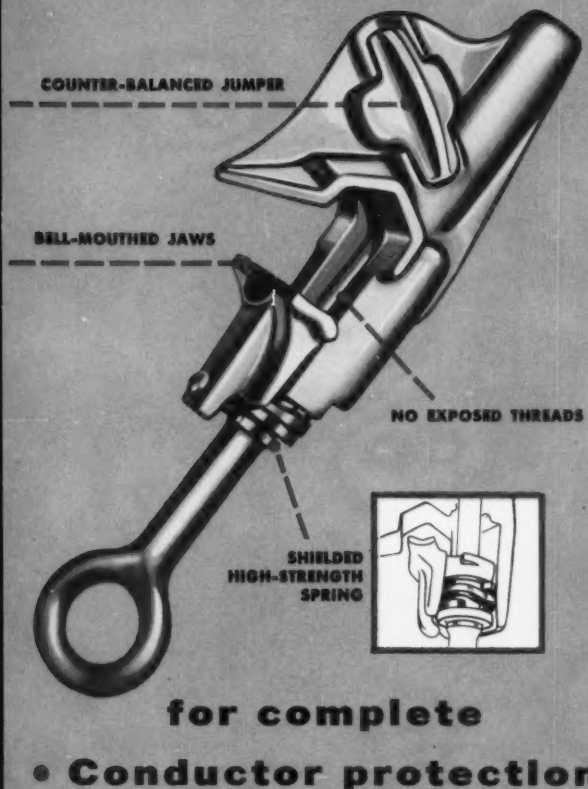
"Our 25 years of continuous development and manufacture of clamps and connectors have proven that properly designed clamps should distribute current to each strand for surge protection. They should have adequate contact area and proper contour for cold flow protection. They should have sufficient conductivity for thermal protection. They should be designed to protect conductor against vibration fatigue.

"That's why Chance puts so much engineering into every tiny detail of clamp and connector design—to *protect your conductor.*"

Serving the Utility Industries since 1907

50TH ANNIVERSARY

A. B. CHANCE COMPANY



for complete

- **Conductor protection**
- **Contact protection**
- **Thread protection**

CHANCE PC CLAMPS

Chance PC (Protected C
offer extra protection for
clamp. The clamp is count
weight to greatly reduce co
is designed with bell-mou
sharp bending that could da

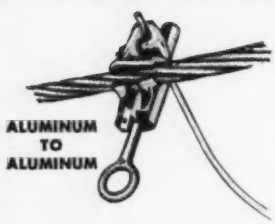
This diagram shows the extra wide jaws that make contact with every outside conductor strand.

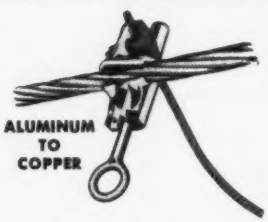
Clamp contact with every
strand gives greater surg
load distribution, less heat
—less radio and TV interf

The shielded high-strengt
with an off-center-loaded
sates for thermal expansio
the conductor—keeps cont

Quick tightening NC threa
of all-weather lubricant t
and sticking—make remo
easy, even in corrosive are
out of the arc zone—can
arcing.

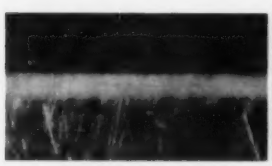
Chance PC Clamps are ava
sizes and types for every co





One AGP* Clamp can be used in all these combinations

Chance AGP Clamps, approved by power company after power company on the basis of their own tests, can be used for all types of connections: aluminum to aluminum, aluminum to copper, copper to aluminum, and copper to copper. They have the advantage of light weight which lengthens conductor life by minimizing the effects of vibration and makes them easy to handle with a clamp stick . . . plus easy identification by their distinctive appearance—plus their most important feature: Versatility. Available in both the "Protected Connection" and "Perma-Grip" types shown on this page.

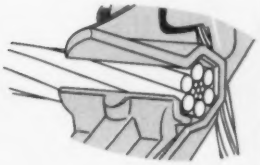


Micro-photo above compares Cha
(left) to commercial plating, one re

Chance FORTIFIED cadm
thick to the aluminum boc
gives you the best possible
electrolysis in all types of
sity FORTIFIED cadmium
protection to both the clam

***CHANCE Aluminum General Purpose—Al to Al, Al to Cu, Cu**

ed Connection) Clamps
for both conductor and
ounter-balanced, light in
ce conductor fatigue, and
mouthed jaws to prevent
ld damage the conductor.

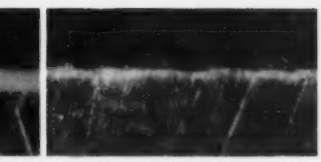


every outside conductor
surge protection, better
heating, less current loss
nterference.

rength spring combined
ded eye screw compen-
nsion and contraction of
contacts tight at all times.

threads run in a chamber
nt to prevent corrosion
removal and installation
e areas. Threads are kept
–cannot be damaged by

e available in all practical
y conductor combination.



s Chance AGP fortified cadmium coating
one reason for AGP's success.

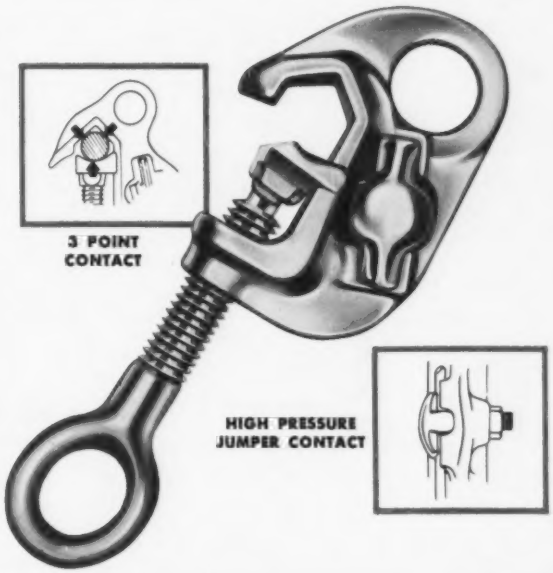
cadmium coating, applied .001"
n body of the clamp—plus zln—
sible resistance to corrosion and
s of connections. This high den-
ium coating gives extra long life
clamp and the conductor.

Cu to Al, and Cu to Cu

PERMA-GRIP the service-proved clamp for all general applications

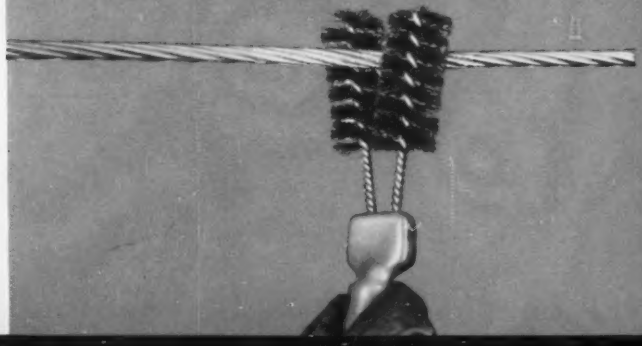
Chance Perma-Grip Tap Clamps have been an industry standard for over 20 years. Perma-Grip Clamps make permanent or temporary connections that hold tight and stay put without vibrating loose. The gripping jaws make 3 point line contact with the conductor. The high pressure jumper contact has a long bearing surface that makes complete contact with all strands.

Perma-Grip Clamps are available in a full range of types and sizes to handle all conductors—with or without armor rods.

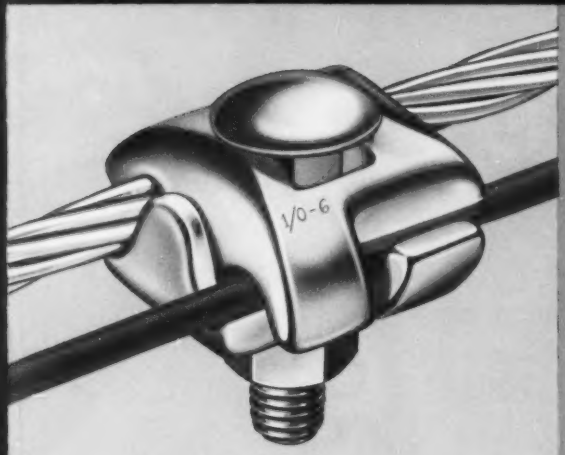


and . . . for longer lasting connections

DAVE HUBBARD recommends: "Remember to wire brush surface oxides off the conductor. Then apply a good corrosion-resistant compound to both the conductor and the contact surfaces of the clamp. You'll protect your conductor and clamps against corrosion and oxidation—add years of life to your connections and reduce costly maintenance. This is particularly important in combating crevice corrosion. Use Chance zln Electrical Contact Aid and conductor cleaning brushes for best results."



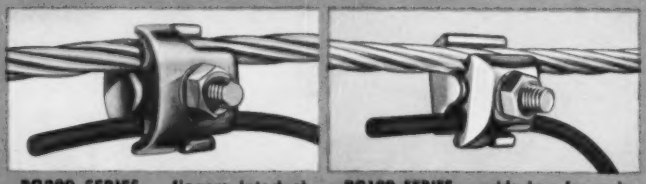
There's always a CHANCE for a better connection



PARALLEL GROOVE CLAMPS

These parallel groove clamps are designed for low cost, easy to install power line connections. Aluminum alloy body has high resiliency to keep connections tight under all load and temperature conditions. Available in two types: "AA", uncoated aluminum body . . . and "AGP" with fortified cadmium coating for all conductor combinations: and in

Your choice of two designs



PG200 SERIES . . . fingers interlock around main line and tap line.

PG100 SERIES . . . wide jaw for main line—interlocking fingers for tap line.

CHANCE PARALLEL GROOVE CLAMPS ARE ALSO AVAILABLE IN 2 AND 3 BOLT TYPES FOR EXTRA CAPACITY.

NEW

U-BOLT CONNECTORS

make tight, low resistance connections

These aluminum-bodied U-Bolts maintain good connections under varying operating loads and temperatures. Designed to prevent "bird-caging" under surge conditions. Available with 1 or 2 bolts. Aluminum or steel hardware.

NEW

CHANCE SPLIT-BOLTS

high conductivity plus strength

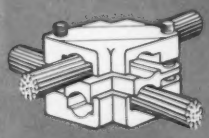
These newly-designed Chance connectors are forged from drawn copper, having the same characteristics as the conductor. These split-bolts stay tight longer because both clamp and conductor have the same coefficient of expansion.

NEW

UNICLAMPS

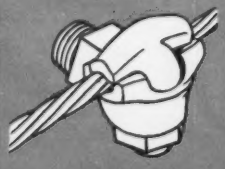
easy to apply—low cost

Now the popular Uniclamp is available with an aluminum body. "One piece" construction—can be installed without taking apart. Available in "AGP" for all connections and uncoated for aluminum connections. Four sizes fit all conductors up to 477 mcm. Uniclamps are also made with copper bodies for copper to copper.



MULTI-TAPS

For cross T, end to end, and parallel connections. Three sizes meet all requirements.



GROUNDING TERMINALS

High strength copper alloy connectors for grounding transformer tanks.

These connectors are part of the complete Chance line which offers a wide variety of clamps and connectors to meet every need. See your Chance Distributor, or write A. B. Chance Company, Centralia, Missouri, for full information.

CC57-3

A·B·CHANCE CO·

ABC INDUSTRIES

Belt Suspenders

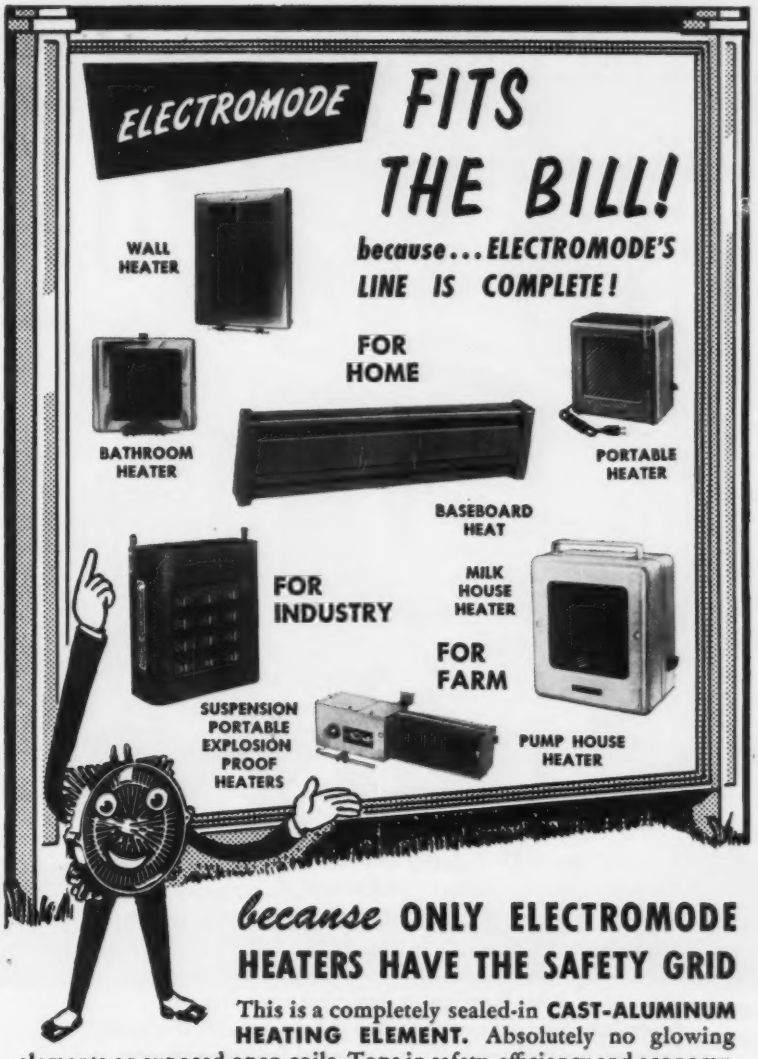
These new belt suspenders, Cat. No. 5213, are reported to increase comfort of wearer and help hold safety belt in right position. Weight of the belt is carried over the shoulders. Two large shoulder pads are said to distribute this weight for greater comfort. Suspenders are equipped with four snaps for four-point suspension. Each snap has an individual buckle for adjustment.
Mathias Klein & Sons, 7200 McCormick Rd, Chicago 45, Ill.

Splice Insulation

This resin pressure splice technique, called "Scotchcast", is used to protect and insulate electrical splices in buried or aerial cable with an injected epoxy resin. It is reported to work satisfactorily on lead, rubber, and plastic sheathed cable or combinations of these as well as on shielded cable.

The mold for each splice is tailor-made in the field by wrapping an open mesh, screen-like tape around the splice as a spacer material and covering the screening with a liquid-impervious plastic tape, which holds an injection fitting. Impregnating material is supplied in a two-section plastic bag with resin on one side and hardener on the other. When the internal separator is broken, the mixture of the two forms a self-curing compound which is injected into the tailor-made mold.
Minnesota Mining & Manufacturing Co, Dept. D7-45, St. Paul, Minn.

(More New Products on page 110)



because **ONLY ELECTROMODE HEATERS HAVE THE SAFETY GRID**

This is a completely sealed-in **CAST-ALUMINUM HEATING ELEMENT.** Absolutely no glowing elements or exposed open coils. Tops in safety, efficiency and economy. The Electromode heating element is guaranteed for five years.

because **ELECTROMODE LEADS IN ELECTRIC HEATING**

ELECTROMODE
Division Of
COMMERCIAL CONTROLS CORPORATION

For more than a quarter century Electromode has concentrated on one specific industry—heating by electricity. From the beginning Electromode has pioneered for a quality product and has continued to expand its line to include the most modern developments in electric heating equipment to serve present day needs. As a result of Electromode's firm stand on quality, complete satisfaction has been the rule with those who either sell, install or use Electromode electric heating equipment.

MAIL COUPON TODAY

MAIL COUPON! Please send your FREE Electric Heating File, containing specifications, illustrations, installations, prices and how to figure electric space heating.

ELECTROMODE Division
Commercial Controls Corporation
Dept. EW-47 45 Crouch Street, Rochester 3, N. Y.

We are interested in ☐ Home ☐ Industrial ☐ Farm

Name.....

Address.....

City.....Zone.....State.....

ALL TUBULAR DUST COLLECTORS

Aren't Alike

. . . and the P-D Tubular is even more radical. Unique internal ducting, called *PLENAFLO, actually provides a plenum *within* the collector casing which permits direct gas flow to the inlet of the tubes *unhampered by a maze of outlet tubes.* It also permits the use of tube bundles so designed that the gas *never has to pass more than two tubes* to reach the most isolated central tube. This patented feature reduces resistance and eliminates gas recirculation that can occur with outlet tubes of varying length.

Further improvement of gas flow was accomplished by designing the tube inlet slots to permit the gas to enter the tube at a natural angle and around the complete periphery of the tube. This reduces sudden changes in direction of gas flow and attendant wear.

Ask our project engineers for information on this unique PLENAFLO collector. Its efficiency and limited space requirements will be of particular interest. Available in either vertical or horizontal tube design sheets, it assures installation flexibility.

Write today for Bulletin on this radical design.

*Trademark

Project Engineers

THE THERMIX CORPORATION

GREENWICH, CONN.

(Offices in 38 Principal Cities)

Canadian Affiliates: T. C. CHOWN, LTD., Montreal 6, Que.

pd

Designers and Manufacturers

PRAT-DANIEL CORPORATION

SOUTH NORWALK, CONN.

POWER DIVISION: Tubular Dust Collectors, Forced Draft Fans, Air Preheaters, Induced Draft Fans, Fan Stacks

More New Products

Russell & Stoll Co, Inc, 125 Barclay St, New York 7, N. Y., has Saf-T-Arc Type J circuit breaking **receptacles, plugs,** and **connectors** for 30, 60, 100, and 200 amp service, rated 600 v ac or 250 v ac or dc.

The Dickson Co, 7422 Woodlawn Ave, Chicago 19, Ill., has Mindicorder recording indicating **instruments** for temperatures from —200 F to +1,000 F and pressures to 2,000 psig.

General Electric Co, Cleveland 12, Ohio, has an NE-2D **neon glow lamp** for sub-miniature indicator and pilot light assemblies. Lamp has midget flanged base, is rated 1/10 w, and operates on 110 to 125 v in series with small resistor.

Fischer & Porter Co, 952 Jacksonville Rd, Hatboro, Pa., offers digital flow **totalizers,** with counting rates from 20 to 1,000 cps, for use with turbine flowmeters. Totalizer accuracy is said to be ±1 count.

Talk-A-Phone Co, 1512 S. Pulaskie St, Chicago 23, Ill., offers a 6-station selective **wireless intercom** which is said to operate on any of 6 channels without interfering with other communication within the system.

Micro Switch Div of Minneapolis-Honeywell Regulator Co, Freeport, Ill., offers an illuminated, lock-down **switch,** designated 52PB7-T2, which functions both as a momentary push-button switch and as a rotary, locking style switch. It is rated 5 amp at 125 or 250 v.

Automatic Temperature Control Co, 5200 Pulaski Ave, Philadelphia 44, Pa., offers the Atcotrol type J-4A current **input controller** which can be set to operate for any portion of a 60, 30 or 15-sec cycle in oven, furnace, or evaporator use. Contacts rated 25 amp at 115 v; 20 amp at 230 v.

National Electric Products Corp, Gateway Center, Pittsburgh, Pa., is marketing Type H **underfloor raceway.** It is available in 10-ft lengths with outlets at 2-ft intervals and measures 6⅜ in. by 1⅜ in.

How to net a runaway jet

THIS barrier net at the end of the main runway on the AAF Interceptor Base on Long Island, N. Y. is a life saver for jet fighters in distress.

Attached to heavy anchor chain, it can stop 30,000 lbs. of runaway jet moving at 160 mph.

Last year barriers of this type saved the Air Force some $78 million. That's why base personnel were so concerned when a severe electrical storm last summer knocked out the cable supplying power to the barrier installation. Already spliced in several places, the 1100-foot cable was shorted out by a tremendous bolt of lightning that struck the end of the runway.

It was essential to get the barrier working again as soon as possible. George Rockwell, Base Electrician, put in a call to the Air Installation Office — but there was no cable available.

AIO in turn contacted Sgt. Miller of Purchasing and Contracting who dispensed wih the usual "red tape."

The Sergeant called Circle Wire and Cable directly, explained the emergency and asked whether he couldn't have 2200 feet of single conductor, 600 volt, Type RR cable picked up right away.

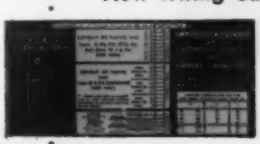
The cable was waiting for the Sergeant when his truck pulled up. Not many hours after that the jets could fly again secure in the knowledge that, if needed, the barrier would be there to keep them from piling up.

As one of the country's leading manufacturers of building wire and cable, *Circle maintains complete stocks of all items.* Not for Air Force emergencies, to be sure—*but because that is the only way to guarantee electrical distributors and their customers the best possible service.* Circle Wire and Cable Corp., 5500 Maspeth Ave., Maspeth, N.Y. Dept. B4

C W C **CIRCLE** WIRE & CABLE
a subsidiary of
CERRO DE PASCO CORPORATION

PLANTS: Maspeth and Hicksville, N.Y. SALES OFFICES: In all principal cities.
RUBBER COVERED WIRES & CABLES • VARNISHED CAMBRIC CABLES • PLASTIC INSULATED CABLES • NEOPHENE SHEATHED CABLES

New Wiring Calculator — FREE!



Send today for this handy, useful wiring aid. Gives conduit sizes, amperage capacities, and helpful motor running data.

MR. PRESIDENT:

WHAT DO YOU KNOW ABOUT RT&E?

As one of America's leaders in the power industry, we think you should know something about one of America's leading suppliers of equipment to the power industry.

We said "leading" not largest. You should know that RT&E, while not big compared to the giants, is nevertheless big in service, in quality, in progress. We've packed hundreds of man years of experience into our ten years of manufacturing.

We think you'll approve our philosophy that we smaller suppliers are most important to the American economy. Sure, we'll be big some day, but in the meanwhile, we help keep the bigger boys on their toes.

For example, no other transformer manufacturer provides a 5 year guarantee or an externally operated tap changer as standard. We do.

All we want to say here is this: Remember the name RT&E. You'll hear it again.

RT&E CORPORATION
WAUKESHA, WISCONSIN

Equipment to help provide power for America

CATALOGS—BULLETINS

● **MISCELLANEOUS:** The following publications have been released by General Electric Co. The address is Schenectady 5, N. Y., unless otherwise indicated:

Hermetic Motor Department, its facilities, quality control and research are described in GED-3060.

Buck-and-Boost Autotransformers are covered in 4-page bulletin No. GEC-1433.

"Tri-Clad 55" Motors for single-phase applications are the subjects of GEA-6240A.

1957 Catalog of GE Heaters and Heating Devices, GEC-1005H.

Drum and Cam Switches are covered in GEA-6307A.

Quiet dry-type specialty transformers, are described in GEC-1432.

Standard and Heavy-Duty Pushbutton Stations are the subjects of GEA-6544. This publication supercedes GEA-3469 and GEA-5043.

"Tri-Clad 55" Polyphase Induction Motors are described in GEC-1420.

Resistance Welding, its synchronous precision control, is covered in GEA-5945A.

Ballast Sound Rating Calculator, GEN-147, is a circular slide-rule device to help in determining beforehand whether or not there will be a noise problem for a given fluorescent lighting installation. Price, $1.00. Write to Section 1662 at Schenectady.

Instrument Transformer 1957 Buyer's Guide, GEC-1028B, contains price and product information on GE's complete instrument transformer line.

Permanent magnets is the subject of publication No. PM-121 issued by the GE Magnetic Materials Section, Edmore, Mich.

Industrial lighting problems and their solutions are covered in "25 Industrial Lighting Solutions", issued by Large Lamp Department at Nela Park, Cleveland 12, Ohio.

Silicones applications are discussed in publication CDS-97 issued by the Silicone Products Department at Waterford, N. Y.

● **TUBING:** A comprehensive booklet describing its tubing, production and processing facilities for handling a wide variety of tubing requirements has recently been released by Ohio Seamless Tube Division of Copperweld Steel Co, Shelby, Ohio.

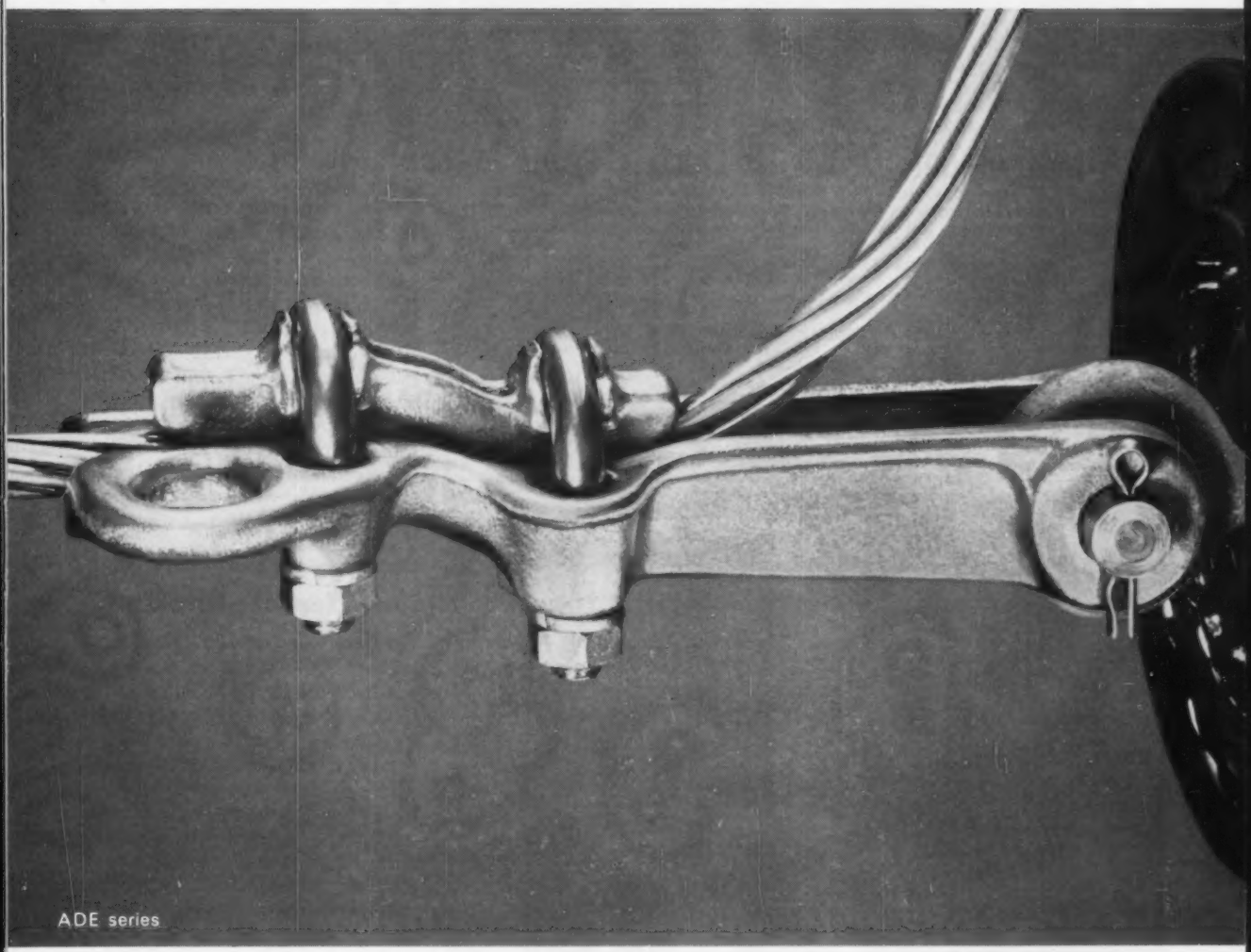
● **TEST EQUIPMENT:** A 6-page bulletin, No. 2058, covers a representative selection of the test equipment line of Simpson Electric Co, 5200 W. Kinzie Street, Chicago 44, Ill.

● **BEARING METALS:** A 4-page flyer describes five different types of Babbitt metals made by the Glyco process. Write Joseph T. Ryerson & Son, Inc, Box 8000-A, Chicago 80, Ill.

● **COOLING TOWER CONTROL SYSTEM:** A new system for automatically controlling make-up water flow, chemical feed, and blow-down rate of cooling towers is covered in a 4-page bulletin published by Bailey Meter Co, 1050 Ivanhoe Road, Cleveland 10, Ohio.

● **MAGNET WIRE TRADE NAMES:** A 16-page directory includes current trade names submitted by 20 magnet wire manufacturers. In addition, it describes briefly physical, chemical, and electrical characteristics and applications common to ten wire classifications. Write to the Magnet Wire Division, Essex Wire Corp, Ft. Wayne 6, Ind.

grip...



ANDERSON ELECTRIC

Anderson's exclusive Snub-Seat straight line clamp has higher holding power than comparable clamps. Built for trouble-free service, its unique "working" features facilitate hot line work, distribute pressure preventing cable damage.

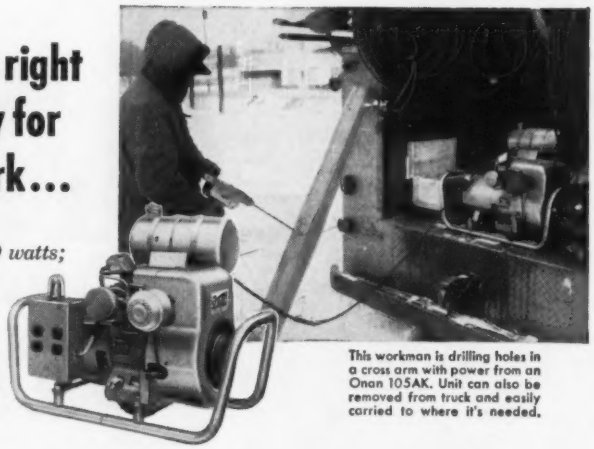
ANDERSON ELECTRIC CORPORATION
Birmingham 1, Alabama

Export Representative: International Standard Electric Corp.

Aluminum & Bronze Power Connectors • Clamps • Fittings • Accessories for SUBSTATION • TRANSMISSION • DISTRIBUTION

Just the right capacity for line work...

develops 1500 watts; weighs only 125 pounds; 4-cycle engine power



This workman is drilling holes in a cross arm with power from an Onan 105AK. Unit can also be removed from truck and easily carried to where it's needed.

Onan Model 105AK-1P Electric Plant

This power-packed lightweight plant supplies all the power you need for electric drills, saws and other equipment . . . and for floodlighting on night jobs, too!

Quick-starting, 4-cycle Onan air-cooled engine is direct-connected to Onan all-climate generator in a single, permanently-aligned compact unit.

Four plug-in receptacles, pilot light and carrying frame are standard. Other lightweight portable and mobile Onan plants from 500 to 10,000 watts.

To save time and speed work on construction and maintenance projects, equip your crews with Onan Portable Electric Plants.

Call your Onan distributor or write . . .

Onan ELECTRIC PLANTS

D. W. ONAN & SONS INC.

2977 University Ave. S.E., Minneapolis 14, Minnesota

Look to Superior for

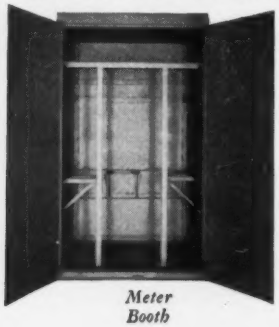
ENCLOSURES

Superior also offers a complete line of

TEST SWITCHES
TEST BLOCKS
SOCKET EQUIPMENT
TEST TABLES

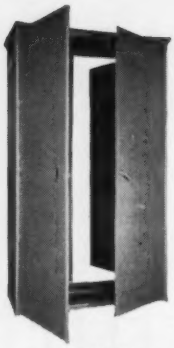
Catalog 55 offers complete information on features, services, types and sizes. Write to:

SUPERIOR
SWITCHBOARD & DEVICES CO.
CANTON, OHIO
A subsidiary of The Union Metal Manufacturing Company



Meter Booth

Current Transformer Enclosure



Double Door Enclosure

System Planning Criteria

(Continued from page 77)

Maximum design voltage drop of a distribution line without a voltage regulator is 8 v on a 120-v base. Maximum design drop with a regulator is 16 v. Voltage regulators correct excessive drop and permit more economical loading of conductors. They are helpful in maintaining adequate voltage on a line until its load reaches a level where the saving in losses from a proposed change will justfy the cost of the change. Regulators postpone major investments and may be recommended even though economic loading limits of the conductor have been exceeded. This permits deferment of improvements until they are required. Voltage regulators are recommended for all power sources, distribution substations, and metering points.

Shunt capacitors help where a power factor penalty clause is in the wholesale power contract. The possibility of excessively lagging power factor and the application of shunt capacitors as a corrective measure should be considered.

Capacity of 2,000 Mw Slated for John Day Dam

An ultimate power capacity of about 2,000,000 kw has been proposed by the Corps of Engineers in its recently released plan for John Day Dam on the Columbia River.

The 5700-ft-long multipurpose structure, favorably considered by the five-man advisory board of consulting engineers, would include a north shore abutment and adjoining navigation lock, 20-bay spillway, 250X2079 ft powerhouse, and south shore abutment.

Design of the recommended plan calls for operation at various pool levels between elevation 257 and 268. About 500,000 acre ft of flood control storage is provided for in the reservoir.

The construction schedule would maintain navigation to barge traffic throughout all stages. Actual work on the project is slated to start next year with earliest completion date of initial power installations set at 1965.

Swings easily in Tight Places

Handy 20 foot rolls of Gold Seal Plastic Tape are popular with workers. Easy to hang on to. Easy to "swing" in tight places. Easy to mold into a neat, thin wrapping. STICKS and STAYS like a quality tape should. It's tops in quality . . . it's GOLD SEAL. For a free sample, write Jenkins Bros., Rubber Division, 100 Park Avenue, New York, 17.

Gold Seal Tape

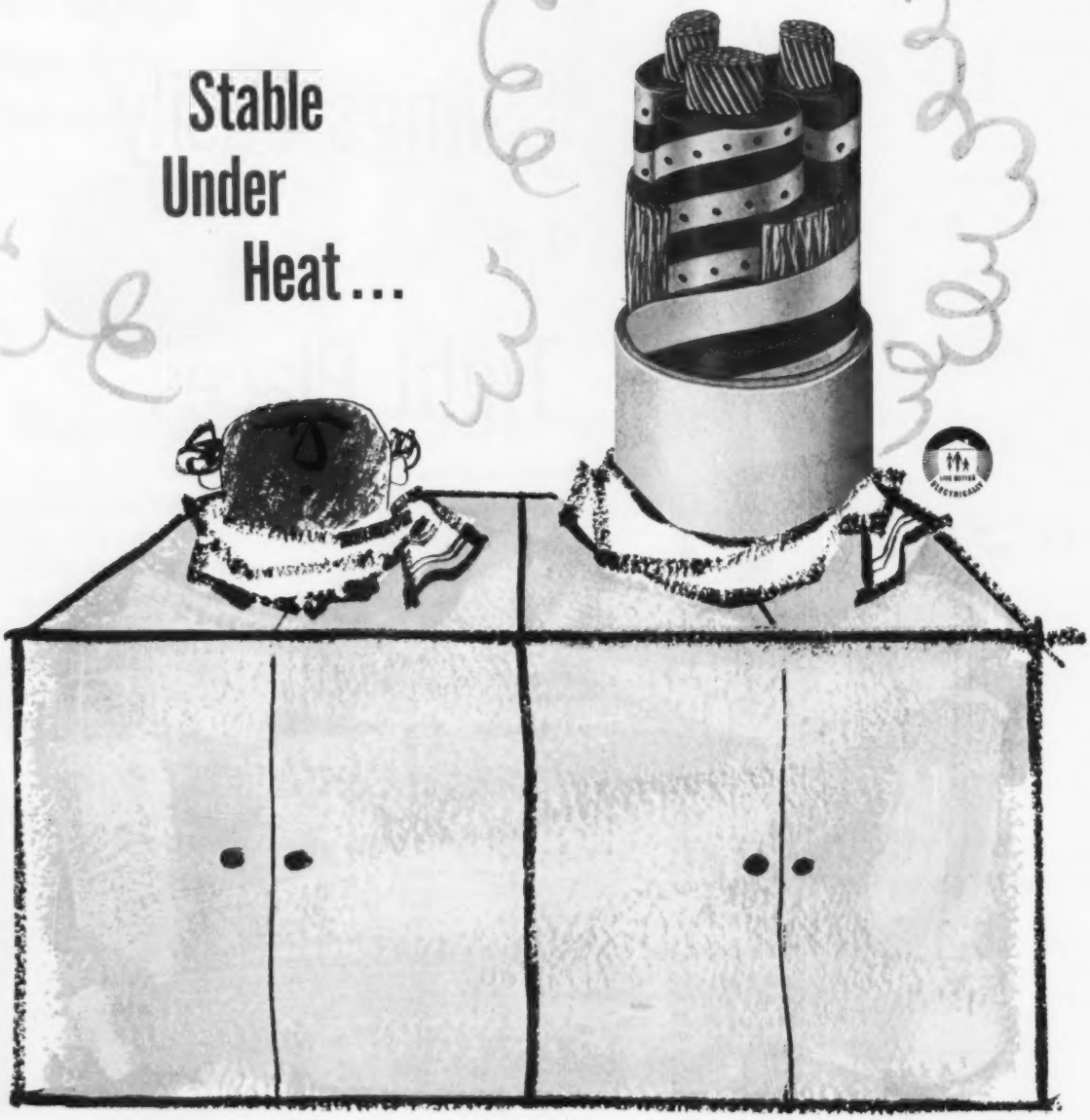
IN HANDY 20 FOOT ROLLS

Ten 20 ft. rolls in the Handy Pack can.

Single 60 ft. rolls in individual metal cans.

Gold Seal FRICTION — RUBBER — PLASTIC TAPES . . . Commercial and Specification Grades

Stable Under Heat...



the Tellurium Lead Alloy Sheath on Roebling Paper Power Cable

Sheath temperatures during wiping operations are in the range of 400°F, emphasizing the importance of heat stability. And you'll find that Roebling Tellurium Lead Alloy Cable Sheath retains its excellent creep resistance and bending fatigue resistance even after being subjected to this high temperature.

This is just one of the *extra-life* qualities built into Roebling Paper Power Cable with Tellurium Lead Alloy Sheath. Learn more about this exceptionally serviceable cable that offers so many savings. Write today for free, new, illustrated booklet that tells the whole story! Electrical Wire Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

ROEBLING

Branch Offices in Principal Cities
Subsidiary of The Colorado Fuel and Iron Corporation

ELECTRICAL BUSINESS OUTLOOK

Electrical World
APRIL 15, 1957

The long-term outlook is exciting. That's the main impression gained from Edison Electric Institute's sales conference last fortnight. For example:

Population will continue to grow rapidly to 228 million by 1976, according to E. J. Klock, GE's manager of economic research and forecasting. Compounded annually, the growth rate will be slightly over 1½% per year.

Electric energy sales will keep on increasing at the rate of 7% a year, Klock said. Present sales will more than quadruple by 1976. To maintain this rate, average annual residential use is expected to hit 11,000 kwhr in 20 years. And present industrial average of 6,000 kwhr per worker will rise to over 21,000 kwhr in '76, or 3½ times more than today, Klock added.

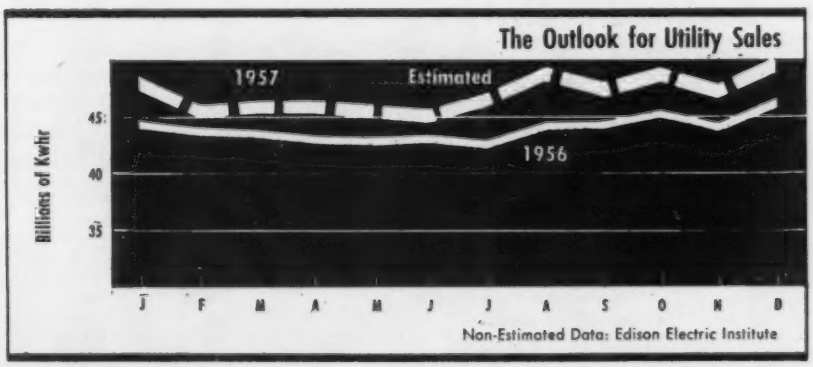
Total standard of living must surge upward by over 50%, according to Arno H. Johnson, vice president and senior economist, J. Walter Thompson Co. "We must accomplish in the next ten years as much improvement in our total living standards as we accomplished in the previous 200 years from colonial times to 1939," he said. On the basis of $600 billion production goal, consumers' discretionary spending power could reach $280 billion by 1967, he said.

• • •

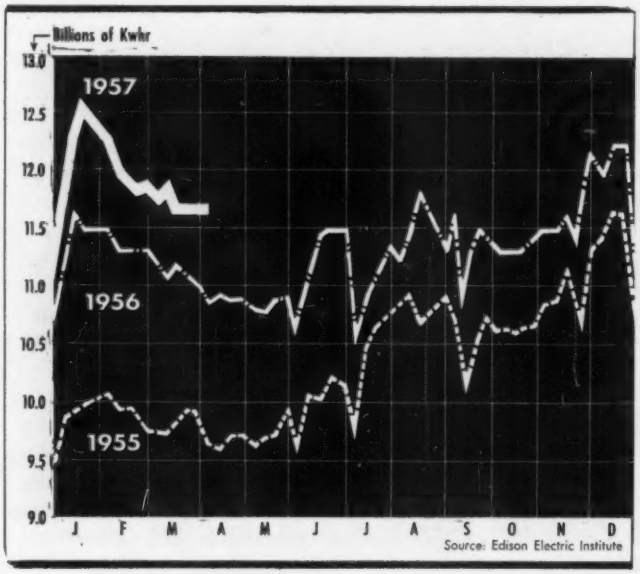
Odds are pretty heavily stacked for steady rise in industrial production, as of the end of the first quarter. But it all depends upon whim of the consumer, who for several months has been sitting on his pocketbook. There's been almost no change in sales of durables and nondurables (seasonally adjusted) since October, though incomes have climbed steadily for six months. Reports from auto salesmen or department stores don't yet suggest a boom in buying.

But a stiff dose of salesmanship could weaken consumer stand-offishness. Consumers are well fixed. It looks as though incomes will keep right on rising all year. Normal spring employment pick-up got started in February. That's earlier than usual, and earlier than expected this year. Hourly earnings are at record levels, and should move higher as some five million workers win automatic or cost-of-living increases under long-term contracts.

Installment credit may add extra zest to sales of big durables later this year. Consumers are now spending a smaller portion of their incomes on goods and services than at almost any other period except during rationing. One reason: Many are still using current income to repay installment debt they took on in 1955. Many of these debts with repayments scheduled over a 30 to 36-month period should be paid off during the last half of the year.



STATISTICS



OUTPUT

Week ended April 6, 11,693,000,000 Kwhr Up 7.8%

Per Cent Change From Previous Year

	Mar. 23	Mar. 30	Apr. 6
Total U. S.	+ 5.3	+ 6.4	+ 7.8
New Eng.	+ 4.0	+ 3.9	+ 5.2
Mid. Atlan.	+ 2.1	+ 2.1	+ 6.1
Cent. Ind.	+ 4.9	+ 6.8	+ 9.1
West Cent.	+ 8.3	+ 8.7	+11.8
Southeast	+ 4.9	+ 7.8	+ 7.5
South Cent.	+12.5	+10.1	+ 9.9
Rocky Mount.	+ 8.0	+ 8.1	+ 7.1
Pacific			
NW	+ 4.7	+ 3.6	+ 4.2
SW	+ 5.5	+ 7.7	+ 7.7

Seasonally Adjusted Index 231.3
Week Ago 229.7
Year Ago 213.7

Atomic Energy Commission requirements—1,150,000,000 Kwhr (Electrical World estimate). Excluding AEC, output increase was 8.5%.

Power Statistics . . .

		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity	Jan.	121.20	120.43	114.55	5.8
Peak—Class 1 Systems. million kw	Jan.	104.0	102.8	95.8	8.6
Estimated Dec. '57 Peak	Dec.	114.5	114.8	112.6	1.7
Production—billion kwhr	Jan.	55.50	52.88	51.12	8.6
Hydro		10.19	10.00	9.36	8.9
Fuel		45.31	42.88	41.76	8.5
Sales—billion kwhr	Jan.	49.15	47.46	46.32	6.1
Residential		14.44	13.22	13.45	7.4
Commercial		7.54	7.34	7.00	7.7
Industrial		24.68	24.44	23.60	4.6
Other		2.49	2.47	2.27	9.7
Fuel Consumption	Jan.				
Coal—million tons		15.98	14.73	15.22	4.9
Oil—million barrels		9.90	8.22	8.22	20.4
Gas—million cu ft		74.77	82.17	68.27	9.5
Net Income Class A & B Co's—million	Dec.	132.82	102.54	124.95	6.3
Residential Customers—millions	12 mos.	45.71	45.62	44.41	2.9
Revenue per kwhr	ended	2.60¢	2.60¢	2.64¢	−1.5
Avg kwhr per customer	Dec. 31	2,969	2,942	2,751	7.9
Avg annual bill		$77.19	$76.86	$72.63	6.3

Business Statistics . . .

Indexes: 1947–49 = 100					
FRB Industrial Production	Feb.	146	146	143	2.1
ENR Construction Cost	Mar.	148.6	148.9	142.6	4.2
BLS Cost-of-living	Feb.	118.7	118.2	114.6	3.6
New Orders for Machinery (1950 = 100)	Feb.	158	152	161	−1.9
NEMA Sales					
Insulation materials	Jan.	154	139	159	−3.1
Electric appliances		96	84	105	−8.6
Wholesale prices	Jan.				
Motors and generators		140.2	140.6	126.5	10.8
Transformers and regulators		146.6	146.6	131.2	11.7
Switchgear and fuses		164.4	163.9	147.5	11.5
GNP—annual rate—$ billion	4th Qtr.	423.8	413.8	397.3	6.7

MANAGEMENT BULLETIN

FINANCE

Two bond issues and one common stock offering of electric companies were on the financing schedule to be sold to the public last week as EW was going to press (see p 19 for the latest financing).

About 98.4% of the 577,883 common shares offered by Baltimore Gas & Electric Co to its commonholders on a 1-for-11 basis at $31 a share was subscribed through the exercise of rights. Balance of 9,281 shares was purchased by an underwriting group headed by the First Boston Corp.

Connecticut Development Credit Corp, a private lending agency, set up exclusively to help small businesses, has made $1,170,900 in loans since its inception in June 1954. This has been instrumental in the creation or preservation of about 2,200 jobs.

Two co-ops get REA loans. An emergency loan to restore service in the storm-stricken areas of Kansas was made to the Western Cooperative Electric Association of Wakeeney for $300,000. Co-op advised the REA that 35% of the 2,128-mi distribution system will have to be rebuilt. . . . East Kentucky Rural Electric Cooperative Corp, Winchester, Ky., receives a $12,351,000 loan to build an additional 60,000 kw steam unit at its Dale Plant and 140 mi of 69 kw transmission line and related facilities.

New financing contemplated. Florida Power & Light Co's Chairman McGregor Smith revealed at a recent meeting of the New York Society of Security Analysts that the company has "no plans to sell any new common stock at this time, but we may issue some common or preferred this fall if the money market is right." . . . Community Public Service Co is planning to sell $3 million first mtg bonds due 1987 in May . . . Iowa Southern Utilities Co may sell $5 million first mtg bonds later this year.

RATES

Louisville Gas & Electric Co will soon ask for an electric rate increase. It may amount to more than $2 million a year. . . . Painesville, Ohio, Municipal Electric Light & Power Plant is planning to up its electric rates an estimated $110,000 a year. This is on top of a 5% utilities tax approved by the City Council in February.

AQUISITIONS

Board of Public Affairs has finally decided to sell the Sabina, Ohio, Municipal Water & Light Dept. Previously the Village Council had repeatedly passed ordinances for the sale. Dayton Power & Light Co has offered $375,000 for the electric plant.

Nantahala Power & Light Co gets North Carolina PUC approval to purchase the Dillsboro and Sylva Electric Co for $389,350 . . . South Carolina Electric & Gas Co gets PSC approval to buy gas properties owned by Atlanta Gas Light Co in Aiken County for $500,000 plus minor adjustments.

Washington Water Power Co and Puget Sound Power & Light Co merger is "definitely out." That is what Puget's Pres Frank McLaughlin told his stockholder's meeting recently. The public, he pointed out, does not want large combines of public power, nor of private power in the Puget Sound-Cascades region. It seems to be more desirous of having the situation remain as it is with local control, he said.

LEGISLATION

Fate of the Washington State Power Commission was sealed recently when Gov Albert D. Rosellini signed into law a bill abolishing the commission. WSPC powers have now been delegated to joint operating agencies authorized by the 1955 legislature. A companion measure, also signed by the governor, creates

a division of power resources in the State Department of Conservation and Development to continue the commission's studies on the feasibility of a steam generating plant.

Massachusetts Senate kills two bills to allow municipal electric or gas plants to obtain money. The first would have permitted municipal plants to borrow money through revenue bonds. The other would have allowed issuance of bonds for the plants on municipal credit beyond the city or town debt limit.

EMPLOYEE RELATIONS

Recruiting Engineers? Connecticut Light & Power Co issues 4-page folder explaining career opportunities at that utility under title, "Career Wanted." It tells of the area, a bit about the company and its training programs, and the chances of promotion. . . . Report by B. F. Goodrich Co indicates that U. S. industry within 10 years will need 100,000 more scientists and engineers than current training trends indicate we will have.

Utility gives financial boost to colleges. Through its Corporate Alumnus Program, Cleveland Electric Illuminating Co promises to match any of its employee's gifts to their alma matas. It will match them on a dollar-for-dollar basis up to a limit of $500.

Atomic Energy Commission now makes it a regular practice to give privately—employed scientists and engineers work experience in its labs and plants.

Here are some wage settlements. Appalachian Electric Power and IBEW agree to a 5% wage increase . . . An agreement was reached between Virginia Electric & Power and IBEW for a general wage increase and the adjustment of inequities in certain classifications. H. Atwood Hitch, vice-president of Vepco and W. R. Grizzard, president of IBEW's Local 1064, refused to give details of the contract . . . Boston Edison and UWUA agree to a 12.5¢ an hour wage increase.

Personnel administration meeting of the Southeastern Electric Exchange is set for July 25-26 at the John Marshall Hotel in Richmond, Va.

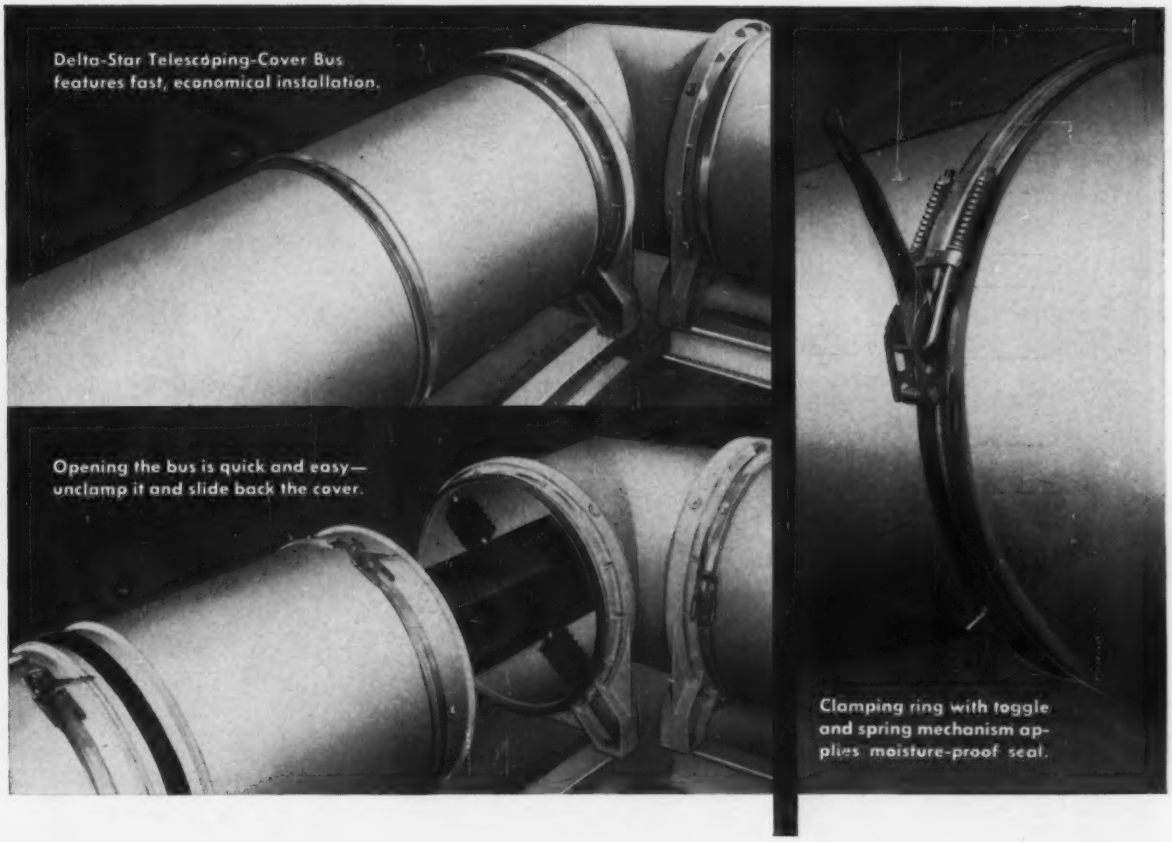
PUBLIC RELATIONS

A good annual meeting gimmick. Shawinigan Water & Power Co showed a 15-min full color motion picture of construction and maintenance work carried out during 1956 to its annual stockholders meeting recently. Film was made by the company's own photographic services. For further info, write J. W. Cook, Shawinigan W&P, 600 Dorchester St, W, Montreal 2, Que.

Improvement of customer relations through more efficient accounting practices is the aim of a 35-min motion picture produced by Puget Sound Power & Light Co. It will be shown to all employees who work with customers' accounts. Film emphasizes the relation of the work of local offices to that of the customer accounting department. It is being produced under the supervision of J. E. Anderson, Puget Sound P&L controller.

ANNUAL REPORTS

Thank you, everyone, for sending us copies of your annual reports. If we've failed to mention them in these pages it is because of lack of space here rather than lack of ideas on your part. We haven't attempted to judge them on a quality basis, but some of the things that have caught our eyes are: Central Louisiana Electric Co's paintings reproduced in 4-color which illustrates its report. The paintings were done by Lloyd F. Hawthorne, a company employee, and represent local industry served by the utilitiy . . . Tampa Electric Co's statistical chart spread in 2-color . . . Michigan Gas and Electric Co's section on "A Well Balanced Utility Enterprise" . . . Potomac Electric Power Co's section on new construction . . . West Penn Electric System's easy-to-read map . . . New York State Electric & Gas Corp's pages on employee relations.


Delta-Star Telescoping-Cover Bus features fast, economical installation.
Opening the bus is quick and easy—unclamp it and slide back the cover.
Clamping ring with toggle and spring mechanism applies moisture-proof seal.

When you're thinking about cost reduction, check Delta-Star's Telescoping-Cover Bus

From installation to maintenance you reduce time and costs with Delta-Star's telescoping-cover isolated phase bus.

Installation is greatly simplified—for speed and economy. Longitudinal sections 6 to 8 ft. long can be pre-assembled and delivered in lengths as large as your facilities can handle. Telescoping covers clamp into position—are locked together with a toggle and spring clamping mechanism—no bolts needed. Clamping rings with fully-trapped, self-sealing neoprene gaskets make the bus as water-proof as it is possible for a gasketed bus to be. Gasketing is at a minimum—no longitudinal gaskets required.

Telescoping-cover bus sections can be opened and inspected without tools—*in just a few minutes.* A 2 ft. 6 in. opening allows ample room for inspection and cleaning.

Current-carrying ability and minimum-heating characteristics of the telescoping-cover bus proved out very well in tests and in use.

For your new bus runs—or replacements—be sure to check Delta-Star's telescoping-cover bus.

Delta-Star Electric Division
H. K. Porter Company, Inc.
Chicago 12, Illinois
District offices in principle cities

HKP DELTA-STAR ELECTRIC DIVISION

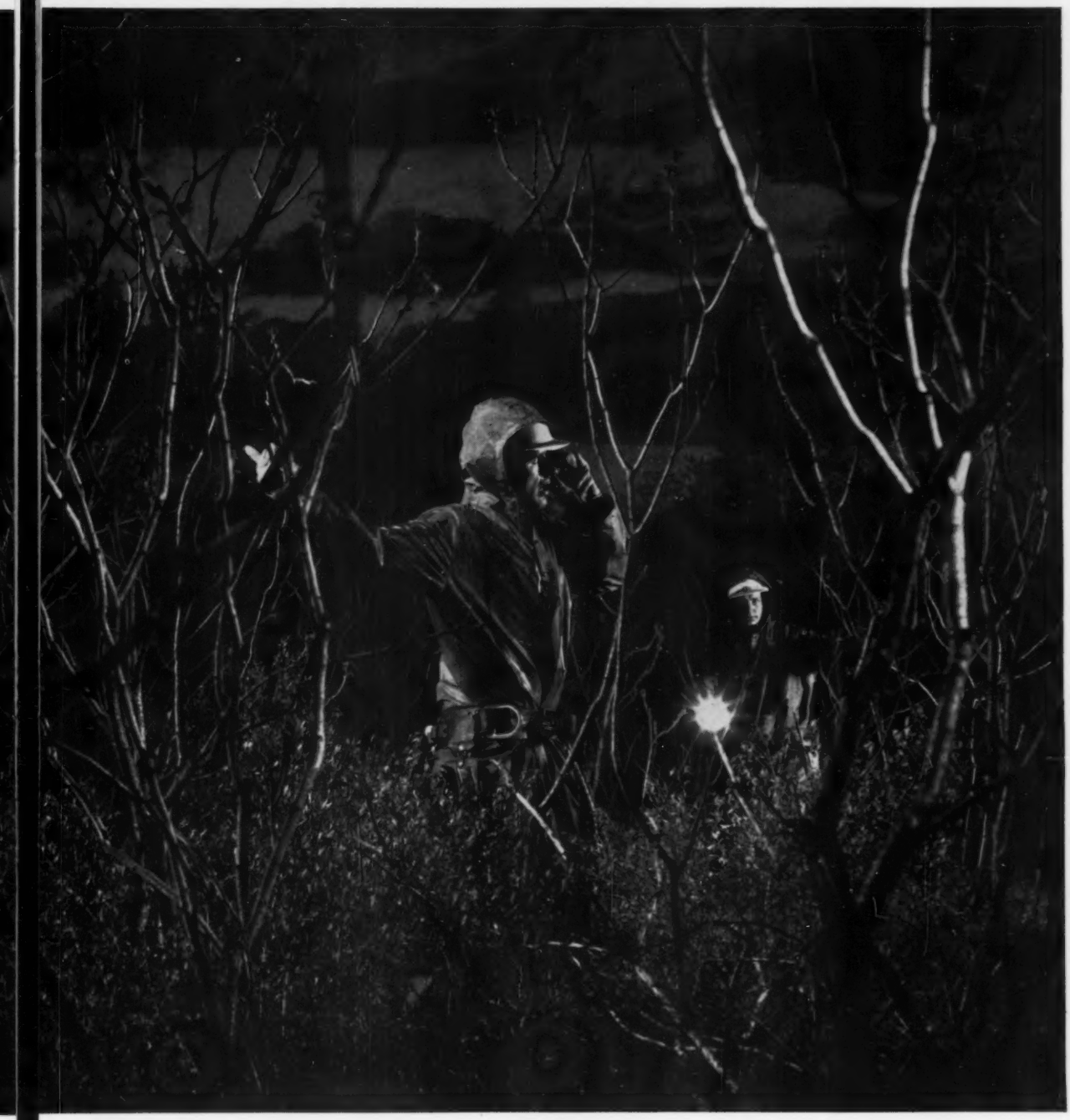
H. K. PORTER COMPANY, INC.

Divisions of H. K. Porter Company, Inc. are: Connors Steel, Delta-Star Electric, Henry Disston, Laclede-Christy, Leschen Wire Rope, McLain Fire Brick, Quaker Rubber, Riverside-Alloy Metal, Vulcan Crucible Steel, W-S Fittings.

The outage that could have been shortened ... *with Dow Brush and Weed Killers*

The trouble call came in at 10:25. The crew reached the scene in seventeen minutes.

From that minute on, they found good reason why Dow brush and weed killers should have been there before them. The first stab of the truck spotlight showed a tangle of undergrowth



that meant the wait for restored power had only started.

The same spring thunderstorms that had kept them hopping for weeks had jumped weeds waist-high and jungle-thick. Thriving brush and trees made the right of way no place for this repair crew in a hurry.

Their next trouble call can be different . . . thanks to Dow brush and weed killers. Esteron* 245, Kuron* and Esteron Brush Killer can clear the right of way of brush and trees. Radapon*, containing dalapon, controls grass all year long. Baron* levels many broad and narrow-leaf weeds with one treatment.

Wherever you're faced with unwanted vegetation, we can help you solve the problem the modern, chemical way. This sure, cost-saving control is waiting for you now . . . at Dow. Write THE DOW CHEMICAL COMPANY, Industrial Section, Agricultural Chemical Sales Dept., Midland, Mich.

Trademark of The Dow Chemical Company

YOU CAN DEPEND ON DOW

GE Makes Transformer With . . .

Molded Cover-Bushing

Transformer tank covers and bushings of molded plastic are being manufactured by General Electric Co's Distribution Transformer Department, Pittsfield, Mass.

Not yet for sale, 100 pole-type transformers with cover-and-bushing molded together in one piece will be given field tests in 1957, according to GE engineers.

This development in molded plastic reportedly promises longer life, reduced maintenance and increased over-all economy, despite the present cost advantage for conventional steel covers and porcelain bushings.

The covers are molded of a thermo-setting polyester resin, reinforced with fiber glass. The bushing is cast epoxy resin modified to increase its impact strength and to make it too non-tracking.

Accompanying picture shows Wm. Barry, left, Frank Nichols, and G. F. Lipsey, inspecting the molded unit.

Kellogg Fabricates PE Piping

Supercritical pressure piping is shown ready for fabrication at N. W. Kellogg Co's Jersey City plant. It will be installed at Philadelphia Electric Co's new Eddystone generating station.

The heavy-walled, type 316 stainless steel pipe is designed to carry steam at 5,000 psi and 1,200 F at the turbine throttle, and will form the vital power piping link for Eddystone generating Unit No. 1. The pipe ordered to required lengths will be bent, welded and heat treated in the Kellogg Co plant. It will be installed at the power station by the same company.

The main steam system calls for 8 leads from the boiler to the mixing header, each with a minimum wall thickness of 2.344 in., and four leads running from the mixing header to the turbine, each with a minimum wall thickness of 2.656 in. A total of about 2,400 ft of pipe will be required, weighing approximately 200 tons.

Midspan Taps Ready Soon for Cabled Secondary

Midspan tap connectors especially engineered for cabled secondary are being developed by Burndy Corp, Norwalk, Conn. The company sees this market—growing use of cabled secondary distribution in suburban residential areas has increased the demand for improved service tap connections.

Known as "Spantaps," the new units will offer flexibility, easy installation, and attractive appearance in making service connections. Unique design of the neutral connector will simplify deadending the service drop neutral.

These connectors will be available for either aluminum or copper conductors. A company spokesman states that installation will require only one tool—a screw driver.

Rome Cable Acquires Cope Plant and Assets

Rome Cable Corp, Rome, N. Y., has purchased the plant, equipment and other assets of T. J. Cope, Inc, Collegeville, Pa., effective April 1. Allen M. Ziegler, Cope's vice president and general manager, will continue to manage the operations at Collegeville.

(Continued on page 126)

New Portable Instrument by General Electric Gives High Accuracy Readings You Can Trust

PACIFIC GAS AND ELECTRIC COMPANY lineman uses the AP-12 to check voltage on secondary side of regulators. Highly accurate, rugged AP-12 is ideal for use in the field.

*Reg. trade-mark of General Electric Co.

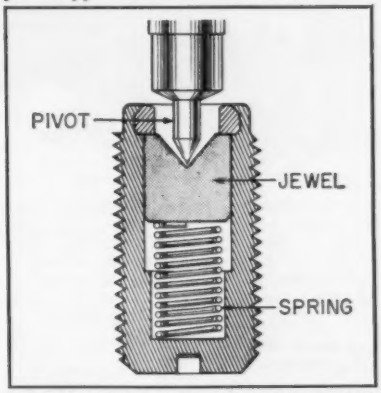
More and more power companies are finding that General Electric portable instruments give highly accurate readings you can rely on. This is especially true with the AP-12, newest addition to the complete line of G-E portables. High accuracy (¼ of 1% at full scale) and rugged, shock-resistant construction make the AP-12 ideally suited for a wide variety of measuring jobs.

COMBINING EXTREME VERSATILITY with high reliability, the AP-12 is equally at home in the lab, shop, or field. Power companies find it the ideal testing instrument, because its high accuracy—even under adverse field conditions—gives you readings you can trust . . . enables you to realize savings in both time and money.

FOR PRECISE A/C AND D/C MEASUREMENTS, choose the AP-12. Its long, more uniform scale is easier to read. Universal terminals and rugged Textolite* case make it more convenient to use in the field. New spring-mounted jewel bearings offer greater protection . . . prevent pivot blunting. And, it's shielded against affects.

FOR ALL YOUR MEASUREMENT REQUIREMENTS, look to General Electric. We offer you a complete line of portables . . . instruments for measuring a/c, d/c, or both . . . with full-scale accuracies from ¾ of 1% to ¼ of 1% . . . whatever is needed for your particular job.

FOR MORE INFORMATION about General Electric portable instruments, contact your nearby G-E Apparatus Sales Office, or write to General Electric Company, Section 582-26, Schenectady 5, N. Y. for your copy of Bulletin GEC-1384.



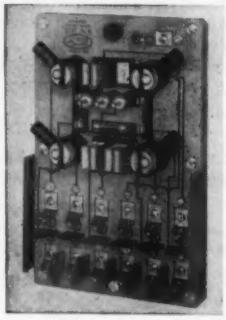
UNIQUE PIVOT-AND-BEARING DESIGN gives longer life to G-E portable instruments. Spring-mounted jewels cushion pressure on pivot points . . . protect against shock and damaged jewel assemblies . . . substantially reduce what is a major maintenance problem in most portables.

GENERAL ELECTRIC

New! TEST JACK
New! QUICK CONTACTOR
WITH
EXCLUSIVE STATES FEATURES

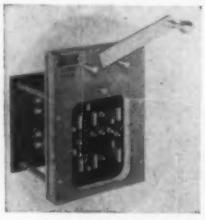
Now in Production!
POLYPHASE METER TEST JACK

(Cat. No. 99121)



Will accomodate standard 3-element self-contained, 2-element, 3 ph., 4 wire Delta self-contained; 2½ element, 3 ph., 4 wire WYE self-contained; and 3-element 3 ph., 4 wire Delta self-contained meters.

Jacks for other poly phase meters soon available.



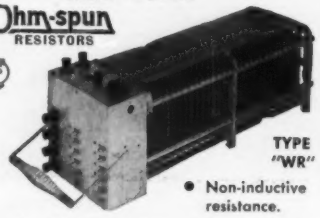
200 AMPERE QUICK CONTACTOR

(Cat. No. 99209-B)

Simply swing lever in one direction to open all blades simultaneously; slide in meter and swing lever in opposite direction to make positive contact. 200 amperes capacity.

RELAY LOADS

Ohm-spun RESISTORS



TYPE "WR"

- Non-inductive resistance.
- Smooth adjustment from .05 amperes to full capacity of the load.
- Loads are made in different capacities: 30 amperes, 25/50 amperes and 60 amperes.
- Light in weight, yet ruggedly constructed.
- All units self-ventilated.

THE STATES COMPANY
19 New Park Ave., Hartford, Conn.

Please send me information on
☐ Test Jacks ☐ Quick Contactors ☐ Resistance Loads
Title .....
Name .....
Company .....
Address .....
City..... Zone..... State.....

Rome Cable

(Continued from page 124)

H. T. Dyett, chairman of the board, and A. D. R. Fraser, president of Rome Cable Corp, in a joint statement said, "Our customers will now be able to procure an even larger measure of their construction requirements from Rome Cable because we will be offering wire and cable, cable trays and racks and a variety of other equipment for the installation of cable".

Texas Firm Markets Underground Transformer

Electrical Service Co, Greenville, Texas, is ready to market oil-immersed, earth-cooled (OIEC) distribution transformers. Present capacities range from 15 to 100 kva, single phase, and 45 to 112.5 kva, three phase.

This direct burial or completely underground transformer is designed for installations with the top about 3 to 4 ft below the ground surface. Here is an advantage reported for residential, school, park, or institutional areas.

Curtis A. Keen, ESCO vice president, advises that the cooling tube arrangement permits installation by ditch-digging equipment and minimum manual excavation. Tests have been run upon a 18-month basis including summer heat and Texas draught conditions.

CTI Elects Officers

Cooling Tower Institute elected three officers for 1957:

President—Paul R. Hoffmann, president of Lilie-Hoffmann Cooling Towers Inc., St. Louis, Mo.; Vice Pres.—Karel E. Johnson, vice president and general manager of J. F. Pritchard & Co of California, Kansas City, Mo.; Secretary—Denis E. O'Neil, manager of cooling tower department of Foster Wheeler Corp of San Mateo, Calif.; Treasurer—Forrest B. Reed, manager of sales of Marley Co of Kansas City, Mo.; Executive Manager—Raymond C. Kelley, CTI headquarters at 446 Emerson St, Palo Alto, Calif.

Manufacturers' Earnings

Company	Period Months	Period Ended	Net Income 1956	Net Income 1955	Earnings per Common Share 1956	Earnings per Common Share 1955
Anaconda Co	12	Dec. 31	$111,502,358	$65,256,306	$12.85	$7.52
Baltimore & Ohio RR	12	Dec. 31	30,038,261(g)	23,918,782(g)	10.85(g)	8.45(g)
Combustion Engineering	12	Dec. 31	6,510,916	5,624,741	2.04	1.78(e)
Corning Glass Works	12	Dec. 31	18,432,753	18,626,671	2.72	2.76
Du Pont, E. I., de Nemours	12	Dec. 31	383,401,308	431,555,884	8.20	9.26
Elliott Co	12	Dec. 31	1,717,624(f)	1,028,132(f)	2.66	1.38
Foster Wheeler Corp	12	Dec. 31	1,072,085	1,289,602	1.81	2.19
Gulf Oil Corp	12	Dec. 31	282,658,087	218,063,510	9.54	7.79(e)
Ingersoll-Rand	12	Dec. 31	36,075,729	27,496,417	5.96	4.54
Kennecott Copper Corp	12	Dec. 31	143,154,210	125,516,291(h)	13.23	11.60
Mallory, P. R., & Co	12	Dec. 31	3,065,108	2,225,649	2.60	1.90(d)
Motorola, Inc	12	Dec. 31	7,966,817	8,490,539	4.12	4.39
Ohio Brass Co	12	Dec. 31	2,909,476	1,825,234	8.37	5.25
Okonite Co	12	Dec. 31	1,675,125	1,559,497	8.21(a)	8.18(a)
Olin Mathieson Chemical	12	Dec. 31	44,791,071	44,558,102	3.38(c)	3.51(c)
Radio Corp of America	12	Dec. 31	40,031,245	47,525,465	2.65	3.16
Reliance Elec & Engrg	12	Dec. 31	2,921,013	1,893,231	5.22	3.39(b)
Reynolds Metals Co	12	Dec. 31	41,239,902	34,306,521	3.93	3.41
Sangamo Electric Co	12	Dec. 31	2,751,731	2,731,978	3.43(a)	3.41(a)
Texas Co	12	Dec. 31	302,262,620	262,729,738(i)	5.51	4.79(e)

Notes—(a) Based on shares outstanding at end of period. (b) Based on 559,143 shares outstanding on Oct. 1, 1956. (c) Based on average number of shares outstanding during the period. (d) Based on shares outstanding. (e) Adjusted to reflect stock split or stock dividends. (f) Includes special credits of $150,000 in 1956 and $499,168 in 1955. (g) Before sinking fund appropriations, etc. (h) After deducting $11,903,585 for flood expenses, etc. (i) Includes non-recurring net profit of $8,184,530 equal to $0.15 a share, realized on sale of capital assets.

IEC Electronics Vocabulary

A world-wide vocabulary for electronics has recently been published by the International Electrotechnical Commission, a world standardizing body in the electrical field. Terms and definitions are given in both English and French. Terms alone are listed in German, Spanish, Italian, Dutch, Polish and Swedish. The book is available from American Standards Association, 70 E 45th Street, New York 17, N. Y., at a cost of $4.80. Ask for IEC Publication No. 50.

M&M BRIEFS

Alcoa: Aluminum Co of America is now fabricating its own line of conductors covered with polychemicals; the covered conductor department is at Massena, N. Y.

Remington Rand Division, Sperry Rand Corp, New York, will increase, effective June 1, 1957, the monthly rental charges for certain tabulating machines under existing "Use-Service" contracts.

Fairbanks, Morse & Co has a 675-kw trailer-mounted diesel generating plant. The mobile power station is reported to meet size and weight requirements for over-the-highway movement.

Research-Cottrell, Inc, Bound Brook, N. J., designer and manufacturer of electrostatic and mechanical gas-cleaning equipment has added the Aerodyne dust collector to its line. The latter was formerly manufactured by the Aerodyne Development Co, Cleveland.

General Motors Corp employees collected more than $3 million in 1956 for their record-breaking contribution of ideas on ways to better their jobs and improve GM's operations. About 55,335 suggestions were adopted from the 224,796 submitted.

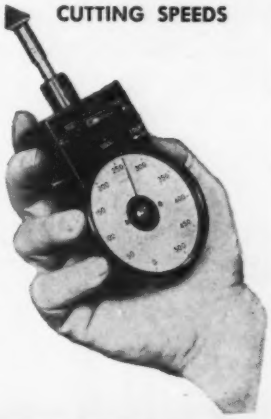
Con Diesel—Consolidated Diesel Electric Corp, Stamford, Conn., reports the acquisition of the business and assets of Lima Electric Motor Co, Lima, Ohio, manufacturer of gearshift drives and electric motors.

SMITHS TACHOMETERS

For Precise and Rapid Measurements of

- **Magnetic Design** Steady readings accurate to ±0.5% at any part of any scale.
- **Instantaneous Reading** No timing or waiting.
- **Self-Powered** Needs no battery. Always ready for immediate use at full accuracy.
- **Nine Ranges** To 50,000 rpm on highest. Interpolate tenths of rpm on lowest.
- **Overspeed Protection** Inherent and built-in.
- **Hold Button** "memorizes" reading when desired.

SHAFT SPEEDS
SURFACE SPEEDS
CUTTING SPEEDS



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CLARENCE J. MARX CO.

Box 4033, Cleveland 23, Ohio

PLM Splicing and Terminating Kits eliminate need for time-consuming planning and ordering ...provide everything needed, in one package, for correctly designed splice or termination.

1261 ways

to simplify cable splices and terminations... with kits and fittings from

PLM

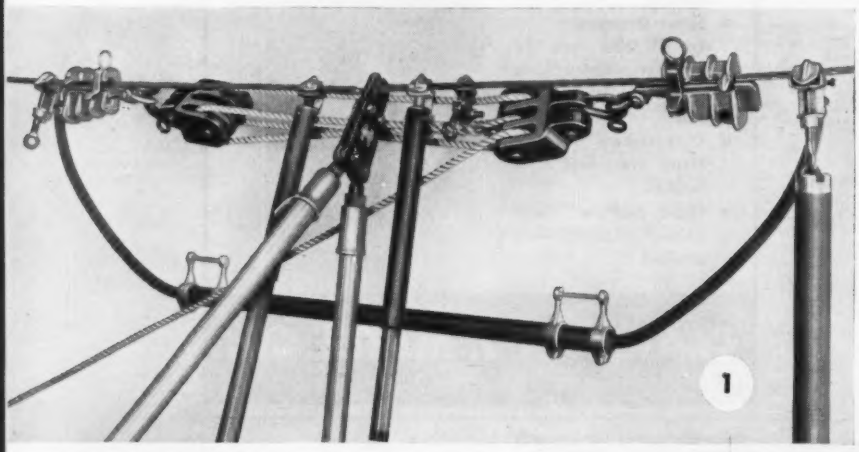
● Here's new, fast help in figuring and ordering cable splicing and terminating needs! This new, 52-page PLM Catalog 301 lists and illustrates PLM unit package kits and fittings in hundreds of standard sizes and ratings, through 23 kv . . . simplifies ordering and specifying special requirements. Whether your needs are for standard or special armored cable fittings . . . 2, 3 or 4-way splices in or to armored cable, non-metallic sheathed cable or lead-covered cable, you'll find answers, fast, in PLM products. Write for PLM Catalog 301 today, or ask for quotations.

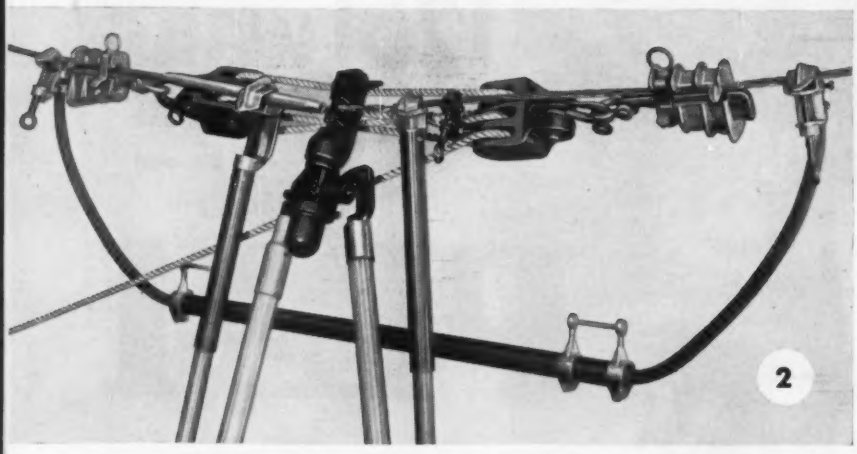
PLM PRODUCTS, INC. · 3873 West 150th Street · Cleveland 11, Ohio
WIRE AND CABLE FITTINGS AND ACCESSORIES

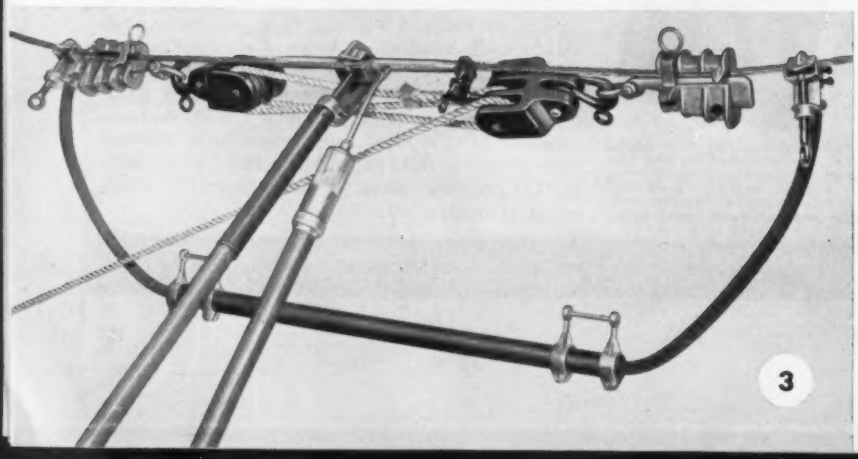
New KEARNEY Method Simplifies

Year by year, uninterrupted continuity of service becomes increasingly important in American homes and industry. Up to now, when it became necessary to make a line splice on ACSR, customer inconvenience and loss of company revenue were unavoidable because the hot line had to be killed before work began.

This new compression splicing method was developed and perfected by Kearney specialists in hot line work. It not only simplifies the making of hot line splices on ACSR, but also provides time and cost savings. Only brief demonstrations are required for linemen to grasp the complete Kearney technique, and the necessary tools, equipment and connectors have proved themselves in use on power lines throughout America.







(1) INSTALL EQUIPMENT, CUT WIRE—After conductor is thoroughly cleaned with a wire brush, cum-a-longs are installed, insulated rope blocks are hooked into the clevises of cum-a-longs, and a fiberglass insulated jumper installed on the conductor.

Next, both the steel and aluminum sleeves are measured, so that properly spaced cuts may be made in the conductor. A hot line clamp is placed on the conductor at the end of the aluminum sleeve, so that the aluminum sleeve is properly centered over the steel sleeve.

Holding tools are installed to prevent fraying of the aluminum strands when cutting with a pre-splice cutter. Three cuts are made in the aluminum strands so that the steel core can be installed, one at the center of the steel core, and one at each end.

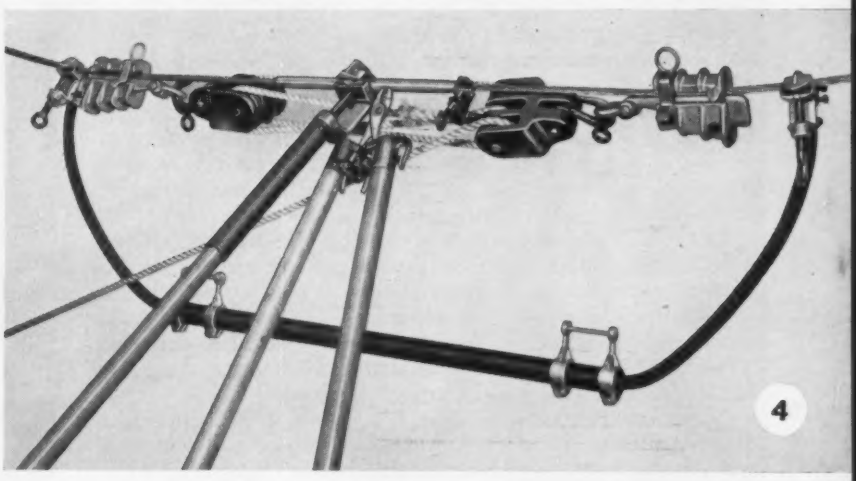
(2) SLIP ON SLEEVES—After the steel core is cut, the aluminum sleeve is slipped over the conductor. The steel sleeve is then installed, and compressed on the steel core. After the steel sleeve is compressed, the aluminum sleeve is pulled up over both ends of the aluminum conductor—and up against the hot line clamp which was placed for centering the aluminum sleeve.

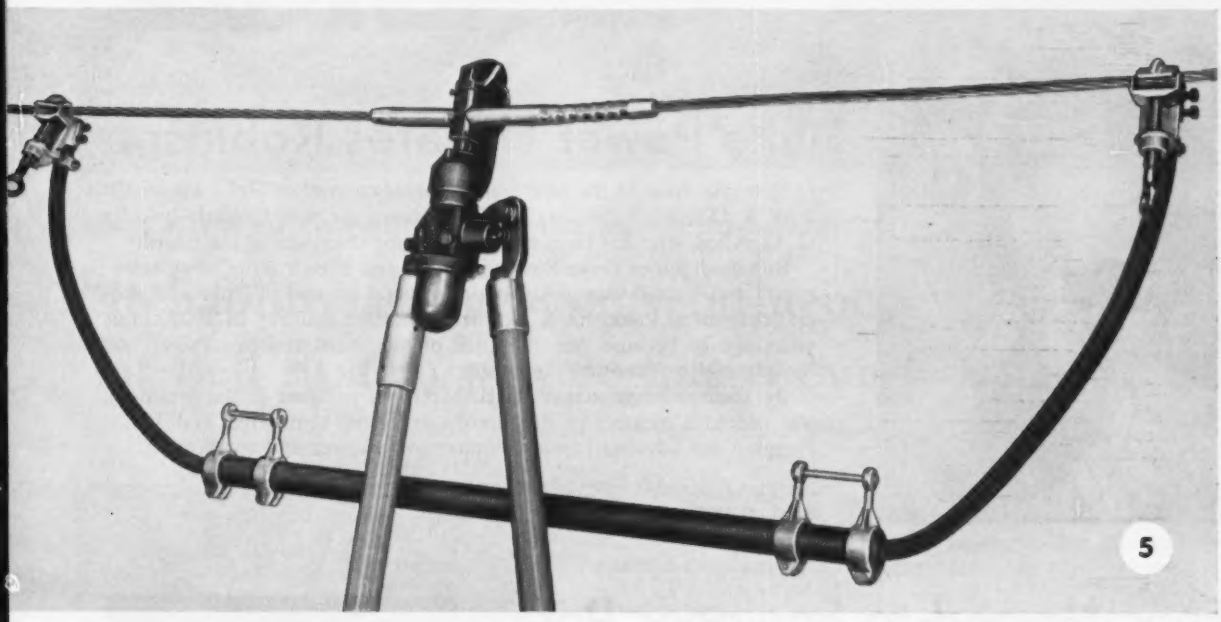
(3) PROTECT CONTACT SURFACES—After aluminum sleeve is centered, the cleaned contact surfaces are protected by forcing Kearnalex inhibitor into the sleeve through the grease holes, using a special grease gun.

Hot Line Splicing on ACSR

(4) INSERT PLUGS—With a pair of insulated combination pliers, plugs are securely inserted in the grease holes of sleeve.

(5) COMPRESS SLEEVE—Insulated rope blocks and cum-a-longs are taken off. Aluminum sleeve is now compressed with a Kearney WH-1 hydraulic compression tool, starting from the plugs and working out toward each end. After aluminum sleeve is compressed, the joint will hold 100% of the breaking strength of the conductor.





Make an appointment through your Kearney Representative for a demonstration soon.

JAMES R. KEARNEY CORPORATION

General Offices: 4224-42 Clayton Ave., St. Louis 10, Mo.

Plants at: ST. LOUIS • FAYETTEVILLE, ARK.
SHENANDOAH & CLARINDA, IA. • GUELPH, ONT., CAN.

356

FOR BETTER CONSTRUCTION...SAFER MAINTENANCE
Specify KEARNEY PRODUCTS

Here's everything you need to do the complete job!

Quantity	Item	Kearney Cat. No.
1	Hydraulic Compression Tool with Dies	WH-1
1	Fiber Glass Saf-T Hook Stick	4266-2
1	Pre-Splice Cutter	1870-34
1	Cum-a-long	1833
1	Cum-a-long	1833-1
1	Conductor Cleaning Brush	4455-62
2	Small Jumper Holding Tools	20852-1
1	Large Jumper Holding Tool	20852-6
1	Insulated Blocks with Nylon Rope	4999
1	Insulated Jumper, 8'	3950-1
1	Insulated Grease Gun, 6'	26625-1
1	Insulated Pliers Holders	4773-1

NEWS ABOUT PEOPLE

Nielsen is New Babcock & Wilcox President

M. Nielsen, executive vice president of Babcock & Wilcox Co, has been elected president of the company. He succeeds Alfred Iddles, president since 1948, who is retiring.

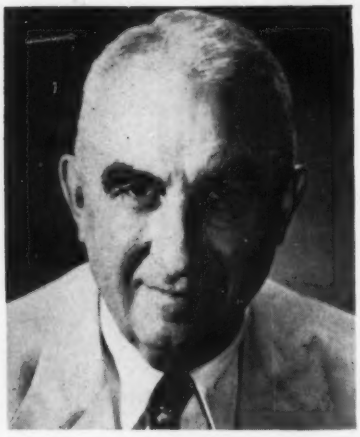
A veteran of 33 years with B&W, Nielsen started with the firm in 1924 as a construction worker. After serving in positions of increasing responsibility, including district inspector, superintendent of marine erection, and plant production superintendent, he was appointed an executive assistant in 1950.

In 1952 he was elected vice president of the Boiler Division's manufacturing department. Soon afterwards the erection department was added to his responsibilities.

Nielsen was elevated to vice president in 1953 and assumed charge of all Boiler Division manufacturing. When re-elected in 1954, he was named to head the entire division and elected to the board. He became executive vice president in 1955.

In another company promotion, J. E. Brinckerhoff, Refractories Division manager since 1953, was elected a vice president. He will continue to be responsible for the division's operation.

M. NIELSEN



Duke Power Elevates Robinson

New chairman of the board and general counsel of Duke Power Co is W. S. O'Brien Robinson, Jr. He assumes the post formerly held by G. G. Allen, who has been named honorary chairman of the board.

Robinson joined Duke Power in 1913, and after a series of advancements, was named vice president and general counsel of Duke and general counsel of Piedmont & Northern Railroad Railway in 1927. Four years ago he became vice chairman of the board at Duke Power and chairman of its executive committee.

By another board action W. B. McGuire, assistant to the president, was named a member of the board's executive committee; and Vance Huggins was advanced from treasurer to treasurer and comptroller.

W. S. O'BRIEN ROBINSON, JR

Enns Named to Engineer Post

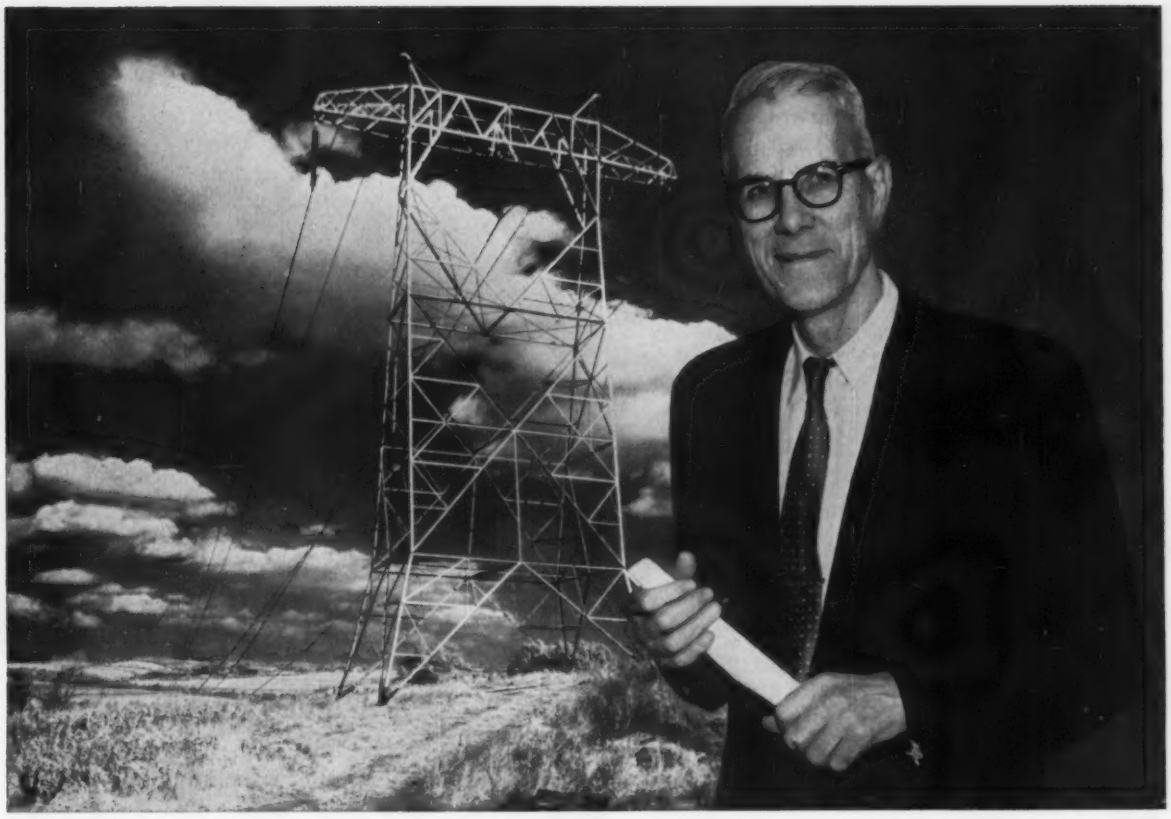
Portland General Electric Co, in a series of engineering staff changes, has appointed as its new chief system engineer Waldo E. Enns.

A graduate of the University of California, Enns came to PGE in 1936 as an electrical draftsman. He has done considerable work in network analysis and has two patents in that field. An Enns power network computer is in operation at Puget Sound Power & Light Co and others are on order for early delivery to Seattle City Light and PGE.

Others advanced were Sidney E. Caldwell, to assistant chief system engineer; W. D. Smith, chief of the planning branch; P. A. Stangell, chief of the electrical design branch; and Ray Palmer, chief of structural design.

WALDO ENNS

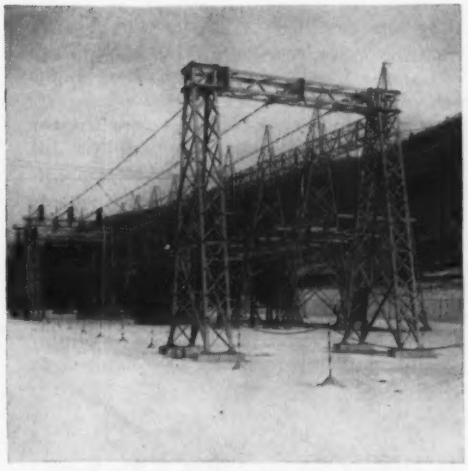
(More News About People on page 134)



How the Bell System serves the power industry

"Reliability and economy influenced our choice of Bell System private line communications"

—E. W. Middleton, superintendent of system operation, Pennsylvania Power & Light Co.



The Lycoming switching station of the PP&L, one of many which are now remotely controlled through Bell System private line channels.

"Within the last five years, we've replaced many of our privately owned facilities with Bell System communications," says E. W. Middleton, PP&L system operations superintendent. "I can report now that these new communications are more reliable, economical and have greater capabilities."

Bell System channels for metering give PP&L's Hazleton dispatchers a continuous reading on generation and load throughout the company's 10,000-square-mile area. Channels for remote control provide centralized operation of many substations. And a private line telephone network connects Hazleton with control centers in seven service areas.

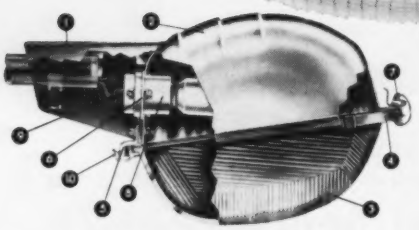
• • •

Perhaps your own communications deserve a fresh look. Why not call your Bell Telephone Company business office? A representative will be glad to study your needs.

BELL TELEPHONE SYSTEM

PRIVATE LINE TELEPHONE • PRIVATE LINE TELETYPEWRITER CHANNELS FOR: DATA TRANSMISSION • REMOTE METERING AND CONTROL • TELEPHOTOGRAPH • CLOSED CIRCUIT TV

New Westinghouse



Check EVERY ONE of these Incomparable Westinghouse Features

1. Cast aluminum slip-fitter for 1¼" pipe. **2.** Heavy, drawn-aluminum reflector, with Alzak process finish. **3.** Westinghouse exclusive Holophane refractor. **4.** Die-cast aluminum globe ring. **5.** 100% wool non-moisture-absorbent gasket. **6.** Moisture-dirt- and bug-proof gasket seal. **7.** Stainless-steel pressure latch. **8.** Porcelain-clad socket. **9.** Wiring terminals easily accessible. **10.** Hinged globe gives easy maintenance! **AND**—A SIMPLE MOVE OF SOCKET FLANGE AND GASKET to inside of reflector ALTERS TYPE OF LIGHT DISTRIBUTION!

GIVES IDEAL TYPE II LIGHT DISTRIBUTION

SIMPLE INSTALLATION MOVE GIVES TYPE I DISTRIBUTION

Local Residential Streets, Secondary Streets, Suburban Thoroughfares

. . . where people live . . .

Now get 2 to 3 times more light! . . . at no appreciable increase in cost!

There is now a mercury luminaire that provides new levels of lighting, pronounced safe and comfortable for residential streets, at almost startling low cost!

This luminaire, named the Westinghouse OV-10, simply permits additional specific applications of remarkably efficient, new-type, mercury lamps—which commonly are now known to supply business thoroughfares with *200%* to *300% more light!—at only nominal increase in cost!* —over that for old-style street lighting!

In addition, this new OV-10 luminaire has been engineered identically to match, *and to complement,* the improved Westinghouse series of OV-20, OV-35 and OV-60 luminaires.

Moreover, this is the famous OV luminaire group that solves virtually every roadway lighting problem. These are the OV luminaires

OV-10 Mercury Luminaire

now brings to residential streets

SAME IDEAL-TYPE ILLUMINATION DEMANDED BY MERCHANTS!

you've heard about—delivering today, throughout countless thousands of applications, *2 to 3 times more light!*

Has same sealed-in, advanced, optical system; same ease, speed, economy of installation and maintenance

See the entire list of special design refinements, exclusive Westinghouse features, of this new, OV-10 luminaire, shown in cutaway illustration at left, including: heavy-gauge aluminum housing and cast aluminum slip-fitter—highly efficient Alzak reflectors—and precision designed refractors, delivering maximum lumens-per-watt to the roadway!

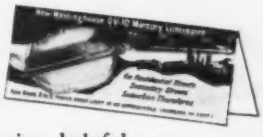
Westinghouse leads all others in the design and development of mercury illumination for all roadway lighting applications

Now this new, OV-10 luminaire enables your Westinghouse representative to *assure* you of *Residential Street Lighting* with *ideal illumination* for *each particular purpose,* at *lowest costs practical today!*

The OV-10 utilizes the following mercury lamps:

L-H4	100 Watts	3,300 Lumens
A-H22	175 Watts	6,800 Lumens
C-H5	250 Watts	11,000 Lumens

Accept



complete information, helpful application data, in folder on this new, advanced, Type OV-10 luminaire. Get folder from your Westinghouse sales representative. Or write Westinghouse Electric Corporation, LIGHTING DIVISION, Edgewater Park, Cleveland, Ohio. J-04409

YOU CAN BE SURE...IF IT'S Westinghouse

Hubbard Appoints Warne a VP

Charles C. Warne, Jr, has been named vice president in charge of sales of Hubbard & Co's electrical materials and aluminum products.

Before his recent promotion, Warne was vice president and general manager of the company's aluminum products sales and manufacturing operations, a post to which he was named in 1950.

Since joining the company in 1936, he has served as sales engineer, assistant sales manager and manager of street lighting sales.

Donald B. Burland is new production manager of electrical materials and aluminum products manufacturing in Hubbard's Pittsburgh plants.

CHARLES C. WARNE, JR

ALBERT BONDS

JON R. RUHLMAN

Bonds, Ruhlman Are Elevated

Preformed Lines Products Co has elevated Albert Bonds to vice president-operations and Jon R. Ruhlman to vice president-research and engineering. Paul A. Henderson was named treasurer.

In his new position, Bonds, former vice president of finance, will supervise the purchasing and production operations of both the Cleveland and Palo Alto, Calif., plants.

Ruhlman, assistant technical director since 1954 and author of numerous technical articles and papers, will continue direction of the company's research and engineering functions.

Joslyn Promotes R. H. Gasch

Robert H. Gasch, vice president of Joslyn Manufacturing & Supply Co, has assumed new responsibilities as general manager of the South East, Gulf, and New York Divisions. He was also elected a director.

Gasch, who joined the firm in 1922, became a vice president of Joslyn Co Division in 1941 and company vice president in 1953.

PERSONAL BRIEFS

Charles H. McGeoch was recently named assistant director of employee relations for Niagara Mohawk Power Corp. He will continue as Central Division personnel manager. The company has also appointed **Elmer E. Fancher** general superintendent of distribution for Western Division's northern district and **John H. DeWitt** as Eastern Division superintendent of transportation.

At Wisconsin Power & Light Co, **W. S. MacDonald** has been named Sheboygan district manager. **Harry Wright** succeeds him as Monroe district manager.

C. Knight Thigpen and **Erwin F. Eckhardt** are new managers of coal purchasing and coal mining, respectively, for American Gas & Electric Service Corp.

Gordon Thompson has been elected a vice president of Electrical Testing Laboratories and **Robert N. Lankering** is new staff assistant to Pres **Hoffman S. Beagle.**

Wilmer P. Hauck is new manager-manufacturing of General Electric Co's low voltage switchgear department. He succeeds **C. Benjamin Ramsdell,** now general manager, commercial and industrial air conditioning department . . . **Roy D. Jordan** becomes manager of advertising and sales promotion, computer department . . . GE's **Eubert F. Taggert** is on temporary loan to U. S. Department of Commerce, where he has been named director-Electric Equipment Division, Business and Defense Services Administration.

Eric Dymond, vice president of Sangamo Generators, Inc, became assistant manager of electronic component sales of Sangamo Electric Co on April 1, when all activities of the former firm were taken over by Sangamo Electric. **William Taylor** has assumed the post of sales analyst for electronic capacitors.

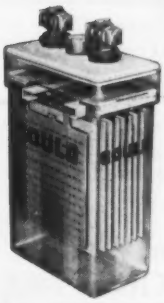
Ralph E. Van Kleeck has joined Day & Zimmerman, Inc, as a staff consulting engineer in connection with management and operations of utilities and industrials.

RCA Components Division has named **Edmour F. Giguere** to the newly created position of manager of new market coordination.

Hy Peskin photo taken at Ice Follies.

You'll go "Head over Heels" for

gould *extra benefits:*



America's Finest
GOULD PLANTÉ
The Aristocrat of
Stationary Batteries

Largest application engineering staff to give you continuous assistance in training your new battery maintenance personnel, establishing good preventive maintenance proccdures, and checking efficiency of charging methods . . . all in the interest of insuring that you get maximum long life from your Gould Batteries.

Ask for new booklet ". . . so you're going to buy an industrial battery" . . . Objective digest of what to look for. Write Gould-National Batteries, Inc., Trenton 7, N. J.

©1957 Gould-National Batteries, Inc.

Always Use Gould-National Automobile & Truck Batteries

More Power to you from Gould

ACCO for Better Values

It's NEW!... ACCO Aluminized Wire

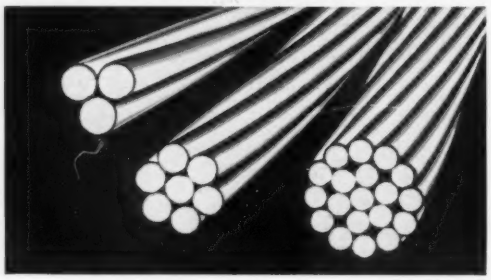
Wire that combines the strength of steel with the corrosion resistance of aluminum

• PAGE has successfully combined two time-tested metals into a revolutionary new wire—ACCO ALUMINIZED—that has a ductile, protective coating of aluminum *bonded* to iron and steel wire by a hot-dip method. This product is covered by and is manufactured under processes covered by U.S. and foreign patents.

Salt spray tests conducted in strict accordance with ASTM procedures show that, for equal thickness of coating, aluminized *outlasts galvanized by more than 2 to 1.*

Now PAGE offers ACCO ALUMINIZED Steel Strand for guy wire, ground wire and messenger wire applications; can be used with galvanized pole hardware. PAGE also now produces ACCO ALUMINIZED ACSR Core Wire for use in conductor cable.

PAGE Strand



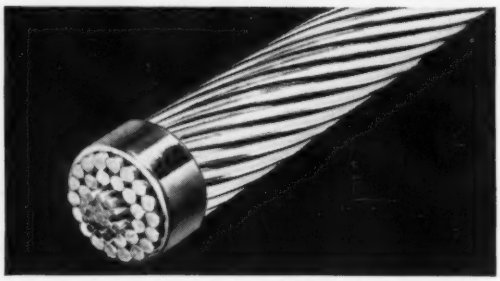
PAGE ACCO ALUMINIZED Steel Strand is available in Common, Siemans-Martin, High Strength, Extra High Strength and Utility grades with physical properties meeting ASTM Spec. A-122-54T and A-363-55-T.

NOTE: We will continue to make PAGE Stainless Steel Strand and PAGE Galvanized Strand, as heretofore, in 3-, 7- and 19-wire construction.

Send for Informative Booklet

How about ductility and adherence properties of aluminized wire? Why does aluminizing create a true duplex coating over the core? How does aluminum "sacrifice itself" to provide electrochemical protection? For answers, write us at Monessen, Pa., asking for Booklet **DH537-A.**

PAGE ACSR Core Wire

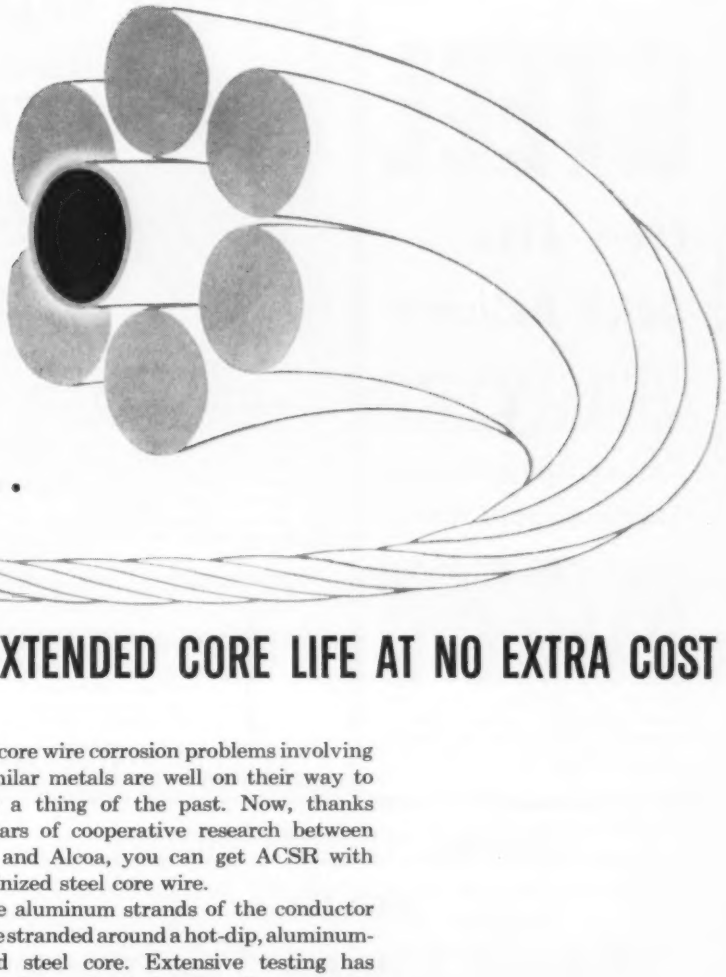


Aluminum Conductor Cable with PAGE ACCO ALUMINIZED ACSR Core Wire is now available from many manufacturers of conductor cable, who early recognized the superiorities of this aluminized wire and encouraged its development. Product quality control is assured by a special testing procedure developed mutually by PAGE and ALCOA.

Page Steel and Wire Division
AMERICAN CHAIN & CABLE

ACCO

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Bridgeport, Conn.



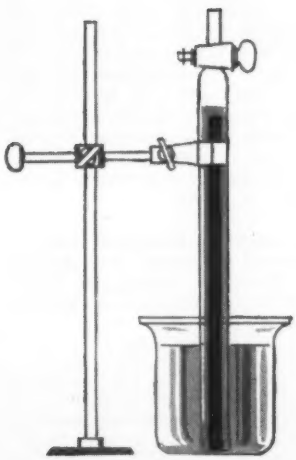
from Alcoa...

ACSR WITH GREATLY EXTENDED CORE LIFE AT NO EXTRA COST

Steel core wire corrosion problems involving dissimilar metals are well on their way to being a thing of the past. Now, thanks to years of cooperative research between Page and Alcoa, you can get ACSR with aluminized steel core wire.

The aluminum strands of the conductor will be stranded around a hot-dip, aluminum-coated steel core. Extensive testing has shown the coating is ductile, adheres tightly to the steel, and steel strength exceeds specification. ACSR with aluminized core wire is a premium product—without a premium price.

reliable quality control test



Alcoa laboratory tests proved that this new development resulted in a good protective coating on steel wire. But before it could be adopted for making Alcoa ACSR, a reliable quality control testing procedure was necessary. A visual check wasn't satisfactory. Results had to be measurable. The test had to prove the integrity of the coating.

A simple test, using a simple apparatus, was developed by Alcoa and Page engineers. It will be used by both Page and Alcoa. It can be used by customers.

Your Alcoa representative has full details on these major developments to combat corrosion problems. Ask him about them or write, ALUMINUM COMPANY OF AMERICA, 2306-D Alcoa Building, Pittsburgh 19, Pa.

Your Guide to the Best in Aluminum Value

THE ALCOA HOUR
TELEVISION'S FINEST LIVE DRAMA
ALTERNATE SUNDAY EVENINGS

STEEL

Every Kind

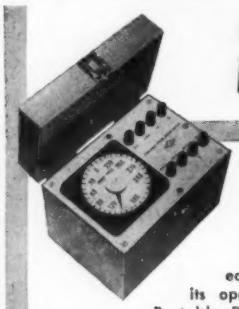
Quick Delivery

Plates, Structurals, Bars, Sheets, Tubes, etc. Carbon, Alloy, Stainless Steels, Babbitt Metal.

RYERSON

Plants at: New York • Philadelphia Boston • Wallingford, Conn. • Charlotte, N. C. • Cincinnati • Cleveland Detroit • Pittsburgh • Buffalo • Chicago Milwaukee • St. Louis • Los Angeles San Francisco • Spokane • Seattle

PORTABLE PHASE ANGLE METER



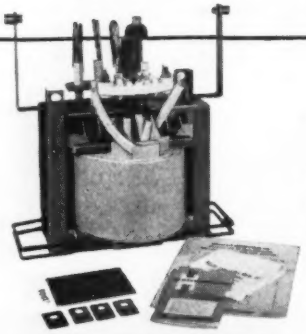
Completely self-contained, and requiring no auxiliary equipment for its operation, this Portable Phase Angle Meter offers a direct way of checking relay and instrument connections, particularly directional over-current relays, differential relays or similar equipment. It may also be used to measure the prevailing power factor in each phase of a polyphase watthour meter installation. The device has a frequency of 60 cycle, with voltage ranges of 60, 120 and 240 volt. Current ranges are 1, 2.5 and 5 amp. . . . DIMENSIONS: 9½ x 6¾ x 5⅝ inches. Weight 19 pounds.

Also available in other voltage combinations

Write for Bulletin #75 for complete information

EASTERN SPECIALTY CO.
PHILADELPHIA 40, PA.

ORIGINAL FACTORY QUALITY plus these Money-Saving Features



✓ **Compact Design** permits higher kva rated assemblies to be substituted in old tanks.

✓ **Light Weight** facilitates installation.

✓ **Adjustable Anchoring Arrangement** assures accurate fit in various size tanks.

✓ **Specially Designed,** oil-filled metal container protects unit against moisture and damage during transit. Assembly is thoroughly dried in controlled oven, factory tested and immersed oven-hot in container.

✓ **Provisions for Mounting** low voltage breaker and windings to operate signal light are standard.

ALLIS-CHALMERS Core and Coil Replacement Assemblies

Get All the Facts. See your A-C representative or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

A-5341

SALES ASSIGNMENTS

COMPANY STAFFS

American Blower, a division of American-Standard, has appointed Richard C. Walsh manager of its new branch sales engineering office in Green Bay, Wisc.

BullDog Electric Products Co's Clarence E. Meister has been named Toledo district sales manager.

Graybar Electric Co, Inc, has named D. L. Pullian as manager at Oklahoma City and W. D. Anderson as operating manager at Springfield, Mo.

International Business Machines Corp's sales district 13 has as its new applied science manager Alvin L. Harmon. He will coordinate IBM's activities in the application of electronic equipment to research, engineering, and management science problems for customers in California, Colorado, Nevada, Utah, Wyoming, and Hawaii.

Johns-Manville Corp has designated Jack W. Davis as regional sales manager for the Pipe Division, Rocky Mountain region. The new region encompasses the states of Colorado, Idaho, Montana, New Mexico, and Wyoming.

Memco Engineering & Manufacturing Co, Inc, has named William J. Hagan, Jr, as representative for the city of Chattanooga (Tenn.) and Tennessee Valley Authority.

Joseph T. Ryerson & Son, Inc, has made the following appointments: Hardie W. Beck, to the newly created post of sales manager, Pittsburgh steel service plant; Milton C. Fidgeon, to assistant sales manager, New York area steel service plant; Ronald S. Yale, to products sponsor for sheet and strip sales, Milwaukee plant.

Westinghouse Electric Corp has named the following to key roles in two newly formed groups that will market the company's consumer products: Louis G. Berger, general manager at the new appliance sales, who will direct his operation nationally from Pittsburgh, Pa; Martin B. Sauer, regional manager, appliance sales, San Francisco; Walter T. Baker, Pacific Coast regional manager for the second new unit, factory field sales, San Francisco; William R. Cooney, factory field sales northwest regional manager, Chicago; and Robert J. Moore, regional manager of southwestern factory field sales, St. Louis.

Weston Electrical Instrument Corp, a subsidiary of Daystrom, Inc, has appointed Hubert B. Stallings as district manager of the Philadelphia territory.

REPRESENTATIVES

C & D Batteries, Inc, has announced that P. J. Biggan & Associates will handle sales of industrial storage batteries from offices in San Antonio, Tex.

Immediate Delivery...

on Mallory Silver Rivet Contacts

Mallory Silver Rivet Contacts are standardized in 70 stock types and sizes—which means you can count on immediate delivery for pilot run or production.

Mallory's standardization program was built on the results of an intensive study of thousands of silver rivet contact orders. From this survey, 70 basic types were evolved to fit the great majority of applications specified in these orders.

Availability from stock means time saved on orders. Standardization means a wide selection of catalog items, often providing an in-stock item for what might otherwise have been a specially tooled job with its associated higher cost and longer wait.

Dimensions, part numbers, ordering information and pricing data are included in the Mallory folder on silver rivet contacts. Before you place a specially tooled rivet order, why not check the Mallory list for a stock item—and tally up added cost savings on your next production run? Write—or ask the Mallory representative for your copy of Bulletin 3-15A.

IF ... your requirements are unusual, and do call for special contacts—Mallory engineers will be glad to assist in designing and specifying—Mallory production facilities are available for contacts or complete contact assemblies.

Expect more...get more from

P.R. MALLORY & CO. Inc.

MALLORY

P. R. MALLORY & CO. Inc., INDIANAPOLIS 6, INDIANA

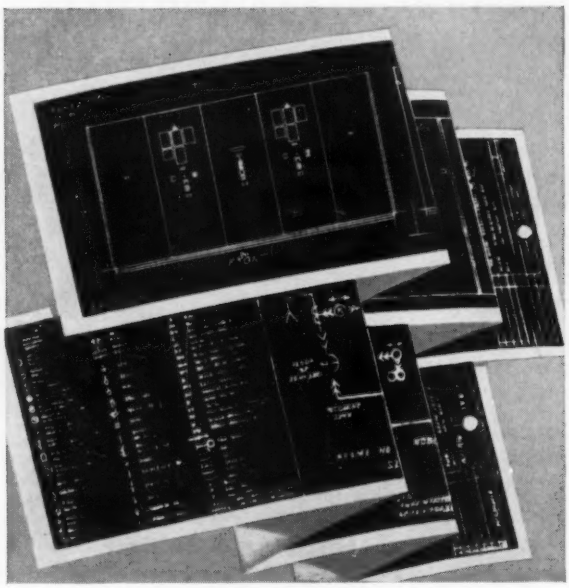
Serving Industry with These Products:

Electromechanical — Resistors • Switches • Tuning Devices • Vibrators
Electrochemical — Capacitors • Mercury and Zinc-Carbon Batteries
Metallurgical — Contacts • Special Metals • Welding Materials

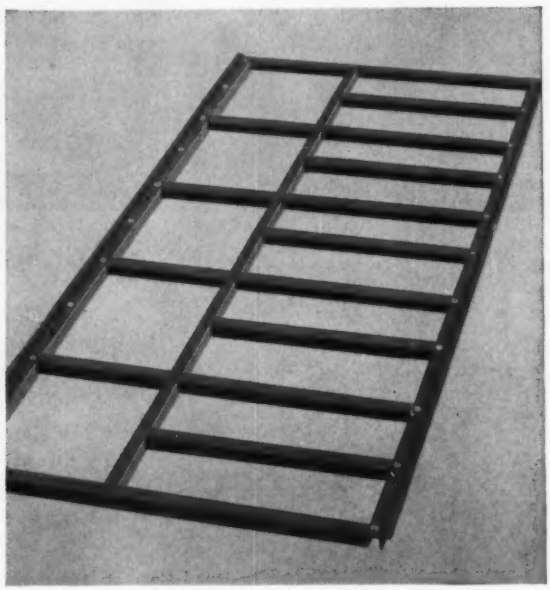
METAL-CLAD SWITCHGEAR

EASY INSTALLATION SAVES YOU TIME AND TROUBLE

I-T-E pre-engineers your installation before shipment... eliminates last-minute on-the-job fitting of switchgear to channel base



1. Complete drawings in advance. Shortly after placing your order, you will receive complete drawings showing the floor plan layout, outline dimensions, and single line diagram of the entire installation.



2. Prefabricated, painted channel base delivered first. Shipped upon request, well ahead of other equipment. Foundation bolt holes are pre-drilled to align with holes in switchgear housing.

Long before delivery of your I-T-E Metal-Clad Switchgear, you begin benefiting from the preliminary engineering and construction work which is a part of I-T-E's service to customers. It's another extra assurance of dependable performance you can expect from I-T-E equipment.

Floor plan, outline and single line drawings are supplied well in advance. Hence conduit can be run, floors poured, channel base set in place, and cables pulled. The switchgear, when it arrives, can be moved into position and connected according to plan quickly—saving you many installation hours on your premises.

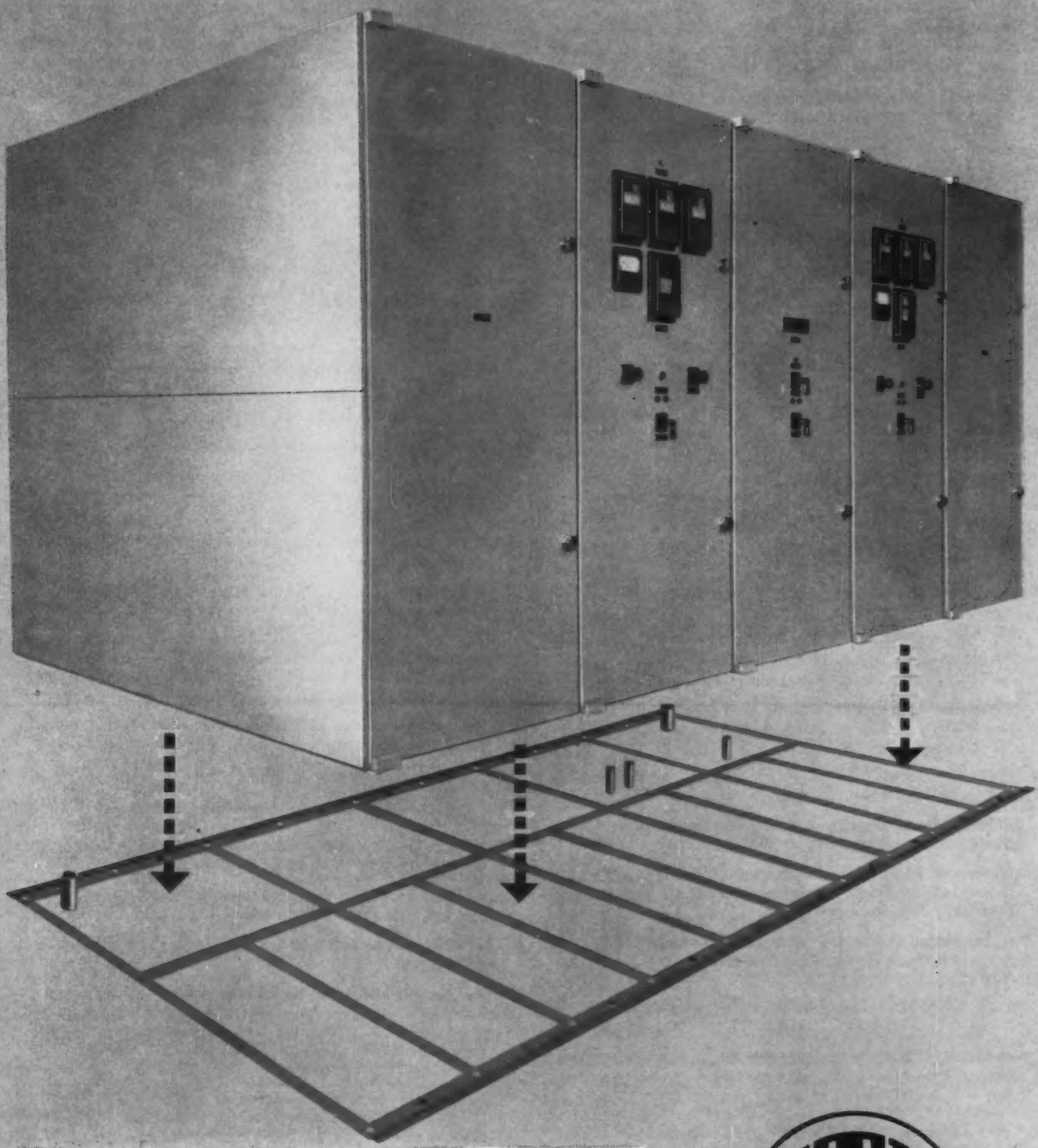
I-T-E's advance planning for you helps insure that your switchgear installation can be completed well within the time allowed by your construction schedule.

In addition, of course, you benefit from the superior engineering, design and construction of the various components making up an I-T-E switchboard—all of which contribute to its faithful trouble-free performance for years after the installation.

If you are planning new construction, get full details on I-T-E Metal-Clad Switchgear, rated through 13.8 kv, 3000 amperes continuous and 750 mva interrupting. Contact the I-T-E sales office near you. Or write for Bulletins 7004B and C. I-T-E Circuit Breaker Company, Switchgear Division, 19th & Hamilton Sts., Phila. 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY—Switchgear Division

IN CANADA: EASTERN POWER DEVICES, LTD.



3. Sure fit—no delay. Channel base is embedded into the floor first. Then when switchgear is delivered it can be installed immediately. Sturdy I-T-E housings can be lifted in one piece by toe jack or chain hoist without distortion.

I-T-E

MEETINGS CALENDAR

APRIL

Agricultural and Mechanical College of Texas—Tenth Annual Conference for Protective Relay Engineers, A&M College of Texas, College Station, Tex., April 15-17.

American Institute of Electrical Engineers—Great Lakes District Meeting, Hotel Fort Des Moines, Des Moines, Iowa, April 15-17; Third Biennial Conference on Electric Heating, sponsored jointly by AIEE and the Toledo section of AIEE, Commodore Perry Hotel, Toledo, Ohio, April 23-24.

Edison Electric Institute—Industrial Relations Committee, sponsored jointly with Personnel Sections of Indiana Electric Assn and Ohio Electric Utility Institute, and Personnel Practices Committee of Pennsylvania Electric Assn, Netherland Plaza Hotel, Cincinnati, Ohio, April 18-19; Meter and Service Committee, Soreno Hotel, St. Petersburg, Fla., April 24-26; Purchasing and Stores Committee's Executive Committee and 10th Annual Meeting, Penn Sheraton Hotel, Pittsburgh, Pa., April 28-May 1; Insurance Committee, Williamsburg Inn, Williamsburg, Va., April 29-30; Accident Prevention Committee, Algiers Hotel, Miami Beach, Fla., April 29-May 1.

Rocky Mountain Electrical League—Spring Conference, Shirley-Savoy Hotel, Denver, Colo., April 21-24.

Northwest Public Power Association—Engineering and Operations Section, Tacoma Utility Center and Winthrop Hotel, Tacoma, Wash., April 23-24.

Lead Industries Association—Annual Meeting, sponsored jointly with the American Zinc Institute, Drake Hotel, Chicago, Ill., April 24-25.

National Industrial Research Conference—Sponsored by Armour Research Foundation of Illinois Institute of Technology, Conrad Hilton Hotel, Chicago, Ill., April 24-25.

Pacific Coast Electrical Association—Administrative Services Section, Hotel La Playa, Carmel, Calif., April 24-25.

Association of Edison Illuminating Companies and Edison Electric Institute—Meter and Service Committee, Soreno Hotel, St. Petersburg, Fla., April 24-26.

Northwest Electric Light & Power Association—Engineering and Operating Section, Sun Valley, Idaho, April 24-26.

American Power Dispatchers Association, Inc—National Spring Meeting, Los Angeles, Calif., April 26-27.

Institute of Radio Engineers—Eleventh Annual Technical Conference on Television, Cincinnati Engineering Society Bldg, Cincinnati, Ohio, April 26-27.

• **Association of Iron & Steel Engineers**—Annual Spring Conference, Netherland Hilton Hotel, Cincinnati, Ohio, April 29-May 1.

MAY

• **American Institute of Electrical Engineers**—Northeastern District Meeting, Wendell-Sherwood Hotel, Pittsfield, Mass., May 1-3; East Central and Middle Eastern District Meeting, Dayton-Biltmore Hotel, Dayton, Ohio, May 7; Protective Relaying Conference, Hightower Auditorium, Georgia Institute of Technology, Atlanta, Ga., May 9-10.

Edison Electric Institute—Transmission and Distribution Committee, Muehlebach Hotel, Kansas City, Mo., May 2-3; Prime Movers Committee, Tides Hotel, St. Petersburg, Fla., May 6-8; Hydraulic Power Committee, Highland Hotel, Massena, New York, May 13-15; Industrial Relations Committee, EEI Headquarters, New York City, May 16; Electrical System and Equipment Committee, Statler Hotel, Buffalo, N. Y., May 20-21; Accounting Division Time and Place Committee jointly with AGA, AGA Headquarters, New York City, May 23; Financing and Investor Relations Committee, Edgewater Beach Hotel, Chicago, Ill., May 31-June 1.

Pennsylvania Electric Association—Hydraulic Power Committee, Skytop Lodge, Skytop, Pa., May 2-3; Communications Committee, Hotel St. Francis, Canton, Ohio, May 6-7; Eighth Annual Customer Relations Conference, Hotel Hershey, Hershey, Pa., May 8; Electrical Equipment Committee, Hotel Roosevelt, Pittsburgh, Pa., May 9-10; Relay Committee, Bedford Springs Hotel, Bedford Springs, Pa., May 16-17; Systems Operation Committee, Skytop Lodge, Skytop, Pa., May 23-24.

Southeastern Electric Exchange—Engineering & Operations Sections, Fontainbleau Hotel, Miami Beach, May 2-3; Heat Pump Steering Committee, sponsored jointly with Association of Edison Illuminating Companies and Edison Electric Institute, Battle House, Mobile, Ala., May 10-11.

Air Conditioning and Refrigeration Institute—Annual Meeting, The Homestead, Hot Springs, Va., May 5-8.

• **Northwest Electric Light & Power Association**—Business Development Section, Vancouver, B. C., May 6-8.

• **Appliance Parts Jobbers Association, Inc**—18th Annual Meeting, Balmoral Hotel, Miami Beach, Fla., May 7-11.

Electric Companies Advertising Program—Copy Group Meeting, Hotel Statler, Cleveland, Ohio, May 8.

Public Utilities Advertising Association—Annual Convention, Hotel Statler, Cleveland, Ohio, May 8-10.

Industrial Nuclear Technology Conference—Museum of Science and Industry, Chicago, Ill., May 14-16.

Pacific Coast Electrical Association—Annual Convention, Fairmont Hotel, San Francisco, Calif., May 15-17.

• **New York State Society of Professional Engineers**—1957 Engineering Industries Exposition in connection with its annual convention, Statler Hotel, New York City, May 16-18.

American Institute of Mining, Metallurgical and Petroleum Engineers—Eleventh Annual New England Regional Conference, Hotel Statler, Boston, Mass., May 17-18.

National Association of Electrical Distributors—49th Annual Convention, Sheraton Park and Shoreham Hotels, Washington, D. C., May 26-29.

JUNE

• **Electrical Companies Advertising Program**—Management Group, Palmer House, Chicago, Ill., June 2.

• **American Society of Refrigerating Engineers**—53rd Annual Meeting, Hotel Fontainbleau, Miami Beach, Fla., June 3-5.

• **Edison Electric Institute**—Annual Convention, Palmer House, Chicago, Ill., June 3-5.

• **American Institute of Electrical Engineers**—Industrial Power Rectifiers and Semiconductor-Metallic Rectifiers Committees, Morrison Hotel, Chicago, Ill., June 4-5; Summer General Meeting, Sheraton-Mount Royal Hotel, Montreal, Quebec, June 24-28.

• **American Society of Mechanical Engineers**—Semi-annual Meeting, Sheraton-Palace Hotel, San Francisco, Calif., June 9-13.

• **Public Utilities Association of the Virginias**—Accident Prevention Conference, Daniel Boone Hotel, Charleston, W. Va., June 14.

• **American Society for Testing Materials**—Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., June 16-21.

• **Wisconsin Utilities Association**—Annual Convention, Accounting Section, King's Gateway Hotel, Land o' Lakes, Wisconsin, June 23-25.

• Additions this week.

NEW, COMPACT "FMU" METERING UNIT...

up to 42% smaller, 62% lighter

The new line of all-weather outdoor metering units —Westinghouse Type "FMU"—with up to 35% less base area maintains the high accuracy and dependability of its predecessor, the Type "MP". Utilizing compact Form-Fit® design, the completely sealed "FMU" outfit reduces oil content—as much as 56%. Installation is simplified and speeded by weight reduction—up to 62% in the highest rating.

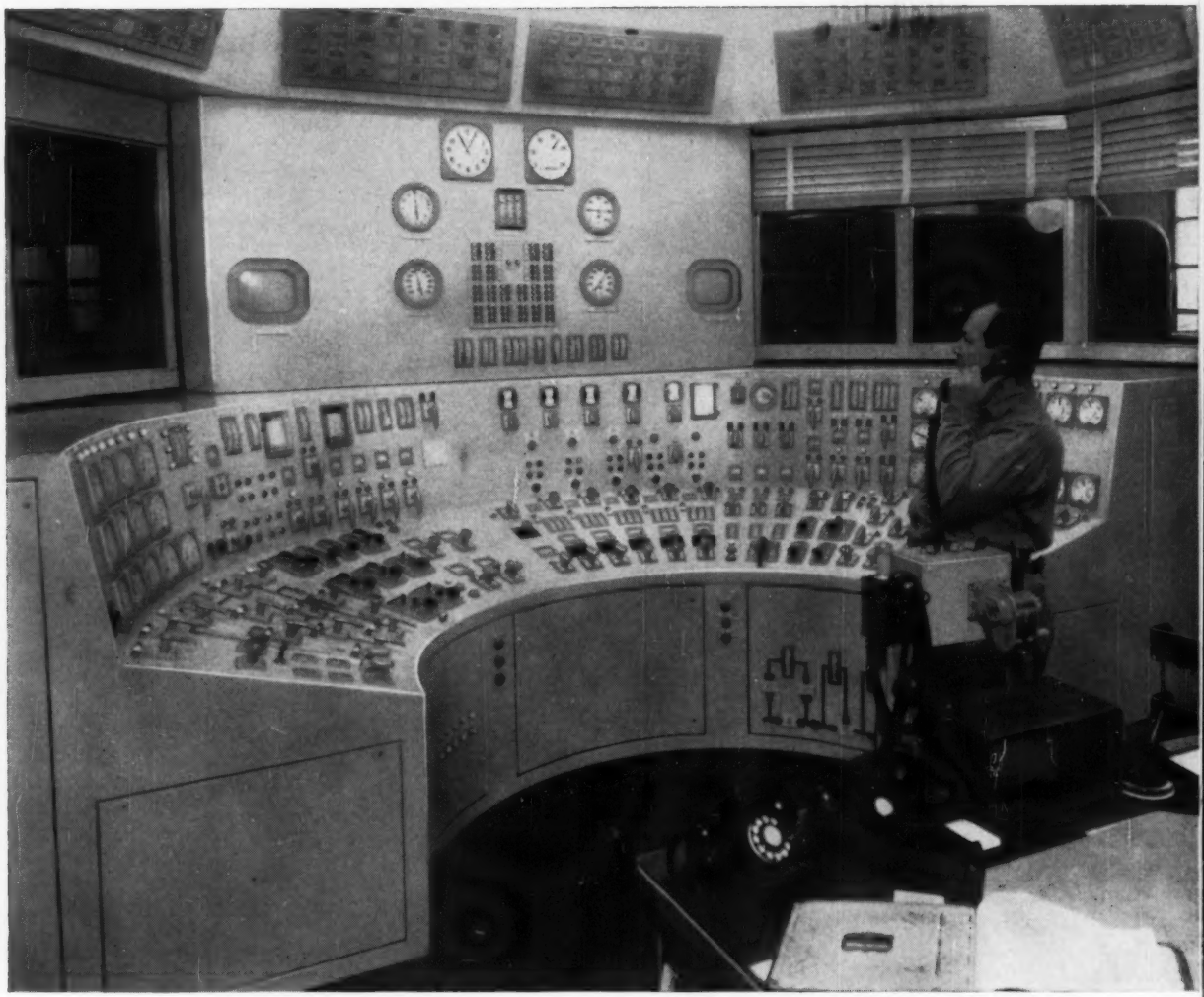
The new "FMU" metering unit, combining both current and potential transformers in one case, when compared with separate components, provides a smaller, neater package, with fewer connections and less installation time. Current ratios can be changed externally, by means of a series-parallel switch for each current element . . . an indicator, easily read from a distance, shows the type of connection.

Available for single- and three-phase service, with primary current ratings 10/20 through 400/800 amperes in 25-, 34.5-, 46- and 69-kv ratings.

For the complete story, call your Westinghouse representative . . . or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-70803

YOU CAN BE SURE...IF IT'S Westinghouse



Advanced central control uses L&N combustion system to

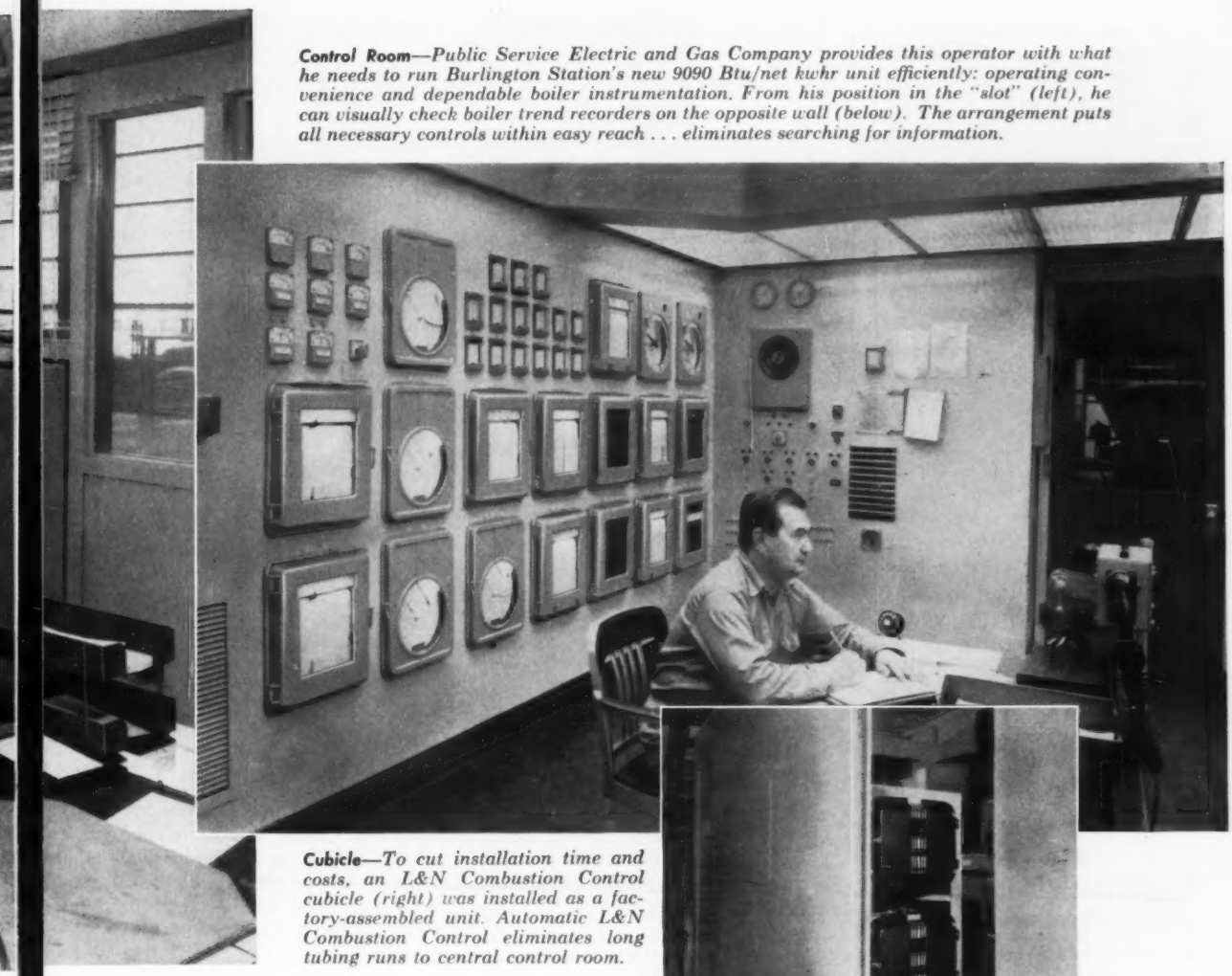
• In this Burlington, New Jersey plant of the Public Service Electric and Gas Company, the newly completed No. 7 Unit's heat rate for the first six months of commercial service was 9090 Btu/net kwhr, the best in the country. Number Seven's boiler capacity is 1,225,000 lb/hr, with turbine throttle steam pressure of 2350 psi, superheat and reheat temperatures of 1100 F and 1050 F, and generator output of 200,000 kilowatts. Furnace fuel is either coal or oil.

A quick glance at Burlington's central control room for this unit is all that's needed to realize that Public Service's advanced engineering techniques went into it. For example, the control room operator has control information brought to *him*. Due to the compact console arrangement he can perform his duties as conveniently and effectively as an airline pilot. There's no wasted space, time or effort.

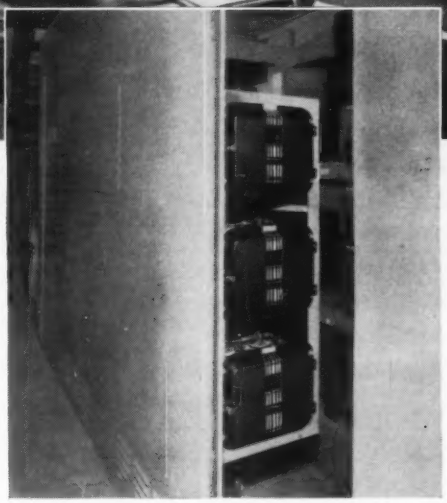
A desirable arrangement—but how is it accomplished without sacrificing reliability, accessibility or economy of components?

A major part of the answer is use of standard Leeds & Northrup *electric* control switches and position indicators. In addition, an auxiliary control cubicle houses the control auxiliaries . . . saves installation time and costs. Made at the L&N factory, it's delivered ready for operation, minimizing those inevitable last-minute installation problems.

Another "problem solver" is L&N combustion control which day after day provides precise steam pressure and excess air regulation—enables the new unit to perform at high efficiency. One reason is that this is a basically electric control—electric drive units introduce no transmission lags regardless of control room location . . . and *no* weather can freeze the electric transmission cables which



Control Room—*Public Service Electric and Gas Company provides this operator with what he needs to run Burlington Station's new 9090 Btu/net kwhr unit efficiently: operating convenience and dependable boiler instrumentation. From his position in the "slot" (left), he can visually check boiler trend recorders on the opposite wall (below). The arrangement puts all necessary controls within easy reach . . . eliminates searching for information.*



Cubicle—*To cut installation time and costs, an L&N Combustion Control cubicle (right) was installed as a factory-assembled unit. Automatic L&N Combustion Control eliminates long tubing runs to central control room.*

guide unit with best heat rate

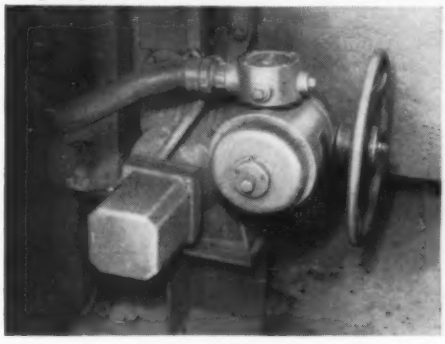
connect to Burlington's outdoor electric L&N drive units.

As you would expect, the new unit was placed on automatic control well within the first week's continuous operation of the unit. Significantly, the complete combustion and steam temperature control, as well as flue gas oxygen measurement for the new Public Service Linden Generating Station, is L&N.

We'd like to suggest that if you're looking toward a new unit which calls for integrated controls, you look to Leeds & Northrup Company, 4938 Stenton Avenue, Philadelphia 44, Pa.

LEEDS Instruments **NORTHRUP** Automatic Controls • Furnaces

Drive Unit—*With rugged outdoor L&N electric drive units (below), the operator knows he's getting efficient operation. No matter what the weather, these units are free of transmission lags . . . give positive control action.*



Jrl. Ad NU9-01-4639

FPC Reports 121.3 Mw Net Capacity Gain

PLANT ADDITIONS DURING FEBRUARY

State	Utility	Plant	Fuel	Capacity
Fla.	U. S. Army Enginners	J. Woodruff	H	10,000
Idaho	Bureau of Reclamation	Palisades	H	28,500
Ind.	Rensselaer Water & Light Dept.	Rensselaer	IC	2,500
Iowa	Cascade Municipal Electric Plant	Cascade	IC	784
Minn.	Hutchinson Municipal Electric Dept	Hutchinson	IC	2,000
N. Mex.	Lea County Electric Cooperative	Lovington, N.	IC	4,000
Ohio	Lebanon Municipal Electric Light Dept	Lebanon	IC	2,000
Utah	Fairview Municipal Electric Light Dept	Lower	IC	300
Wash.	Seattle Dept of Lighting	Ross	H	90,000

RETIREMENTS

Ind.	Rensselaer Water & Light Dept.	Rensselaer	IC	375
Iowa	Cascade Municipal Electric Plant	Cascade	IC	200
Mich.	Grand Rapids Pump Lighting Station		S	3,100
Minn.	Arrowhead Electric Cooperative	Lutsen	IC	1,170

U. S.	Hydro	Steam	IC	Total
Added	128,500	.....	11,584	140,084
Retired	.....	3,100	1,745	4,845
Adjustments Plus	200	.....	2,150	2,350
Adjustments Minus	.....	16,100	150	16,250
Net Change	128,700	19,200	11,839	121,339

H—Hydro, S—Steam, IC—Internal Combustion

United States Capacity as of March 1—Hydro, 25,999,202 kw; Steam, 92,899,657 kw; IC, 2,427,363 kw; Total, 121,326,222 kw.

Oregon Seeks 'Preference' Through Proposed Agency

Establishment by the state of Oregon of an industrial power marketing agency to qualify as a preference customer of public power under the Bonneville power act was suggested Monday by Senator Richard L. Neuberger. The plan is being considered for submission to the current legislature, Governor Robert D. Holmes said.

Senator Neuberger, in a statement issued at Washington, said he had received an opinion from the legislative reference service of the Library of Congress which "makes it evident that an agency of the state of Oregon can qualify as a preference customer under the terms of the Bonneville power act."

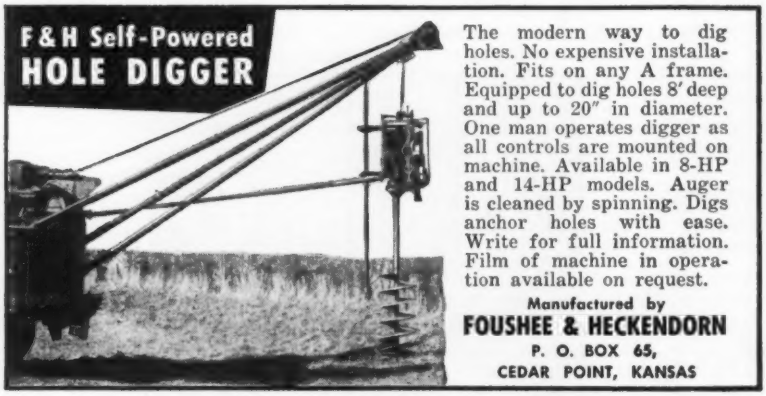
Neuberger said establishment of such an agency by the new state administration "would knock in the head the time-worn argument that Oregon is at a disadvantage because of the preference clause."

Another Step North

Ontario's Hydro-Electric Power Commission may soon enter the highly competitive home heating field with a "heat pump" that warms air in winter and cools it in summer, W. Ross Strike, Hydro vice chairman, told a joint meeting of the Ontario Municipal Electrical association and the Association of Municipal Electrical Utilities.

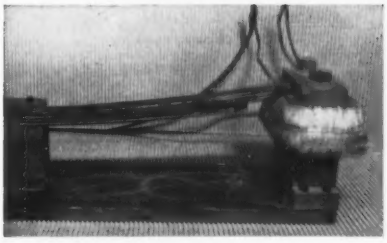
The Hydro official also rated a heat pump installation as "substantially cheaper than a conventional heating and cooling system."

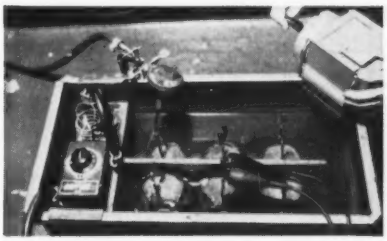
He said the heat pump was only one of many "futuristic" electric devices that will be "in common use" in the next decade.


F&H Self-Powered
HOLE DIGGER
The modern way to dig holes. No expensive installation. Fits on any A frame. Equipped to dig holes 8' deep and up to 20" in diameter. One man operates digger as all controls are mounted on machine. Available in 8-HP and 14-HP models. Auger is cleaned by spinning. Digs anchor holes with ease. Write for full information. Film of machine in operation available on request.
Manufactured by
FOUSHEE & HECKENDORN
P. O. BOX 65,
CEDAR POINT, KANSAS

for longer life and more reliable performance, use

National Polyester Moulded Field Coils





INCREASED STRENGTH

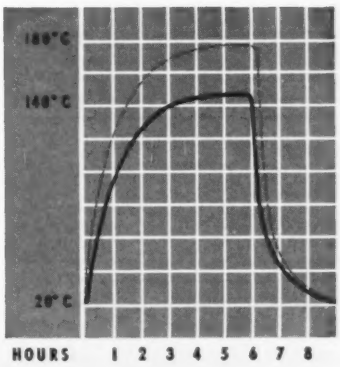
Complete polyester filling bonds all parts of the coil into a strong, unified, shock-resistant construction. The photograph at the left shows a shock test in which an energized and heated coil has been striking an anvil once a second for six months with no adverse effects.

GREATER RESISTANCE TO CORROSIVE ENVIRONMENTS

Complete polyester filling prevents penetration of moisture, oil, conducting dust, and other foreign matter that contribute to coil failures. The photograph at left shows a test in which National polyester coils were immersed successively in water, hot oil, and an iron filing solution. Periodic resistance tests show *no deterioration* of the insulation after several months submersion.

COOLER OPERATION

Absence of voids in the coil enhances heat transfer. The graph below shows comparative heating and cooling cycles for polyester-filled (solid line) and conventional varnish-treated (dotted line) field coils carrying the same amperage.



National polyester-filled field coils can be installed in National service shops or supplied for installation by your own motor maintenance crews. Call your nearby National field engineer or write for details.

NATIONAL ELECTRIC COIL COMPANY

COLUMBUS 16, OHIO, U. S. A.

ELECTRICAL ENGINEERS: MAKERS OF ELECTRICAL COILS AND INSULATION—
REDESIGNING AND REPAIRING OF ROTATING ELECTRICAL MACHINES

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"Yes," mused the V-P in Charge of Engineering to his luncheon companion, "from the information I get, Walters, I've also concluded that we ought to push for an early start on the new plant,—keep clear of those short-capacity situations."

He had been studying young Walters carefully since their conversation had settled on the subject of the Company's future. "You're right, Walters, but where did you get your data? Most of the material available to me——"

"——isn't available to me," Walters finished for him, smiling. "That's true, Mr. Redmond, **most** of it isn't. But I can read the Electrical Business Outlook page of Electrical World and their other forecasts as well as you can—and I do!"

"Of course," replied Redmond, looking a little sheepish. "Why do I always assume that that particular page is written only for me?"

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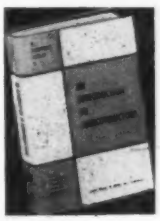

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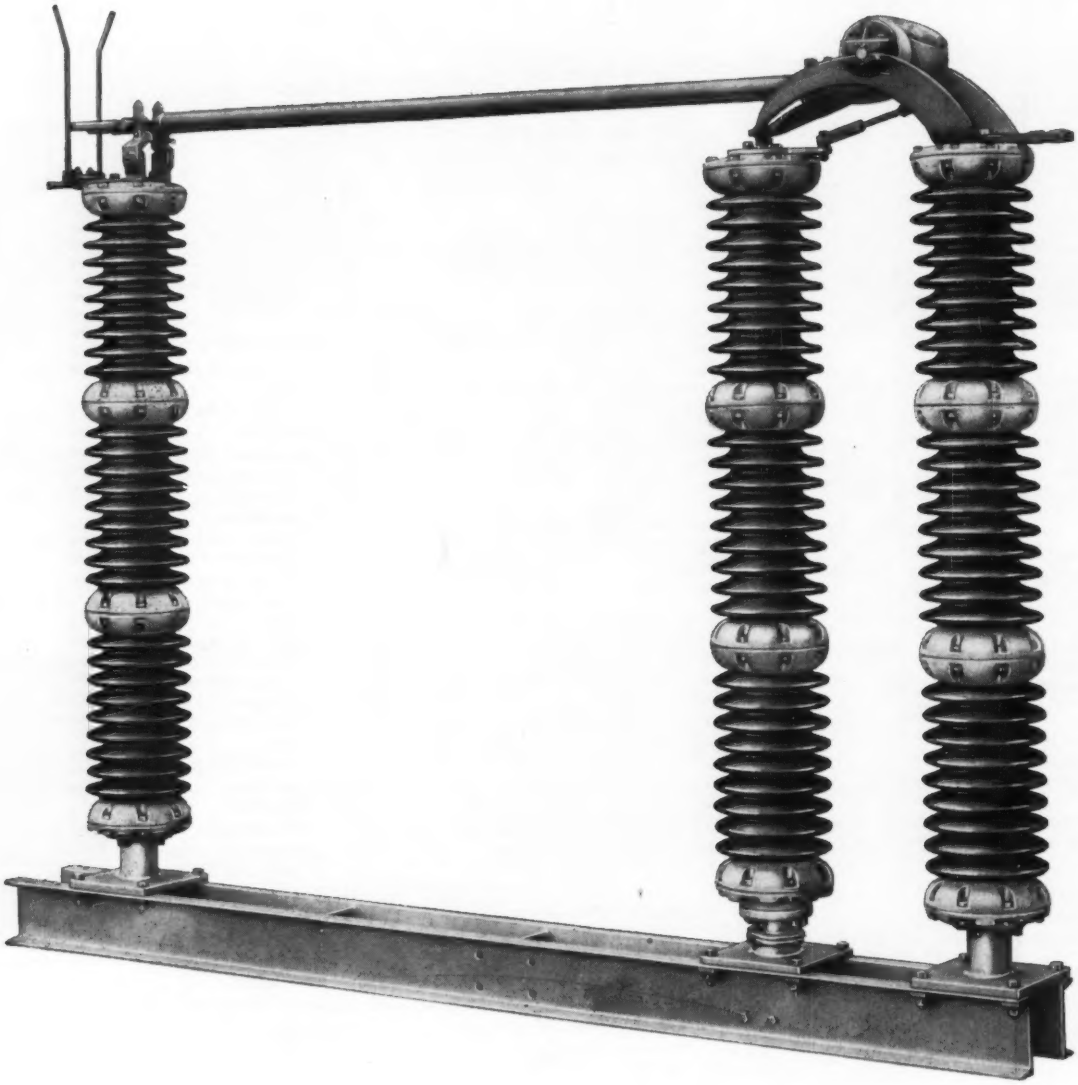

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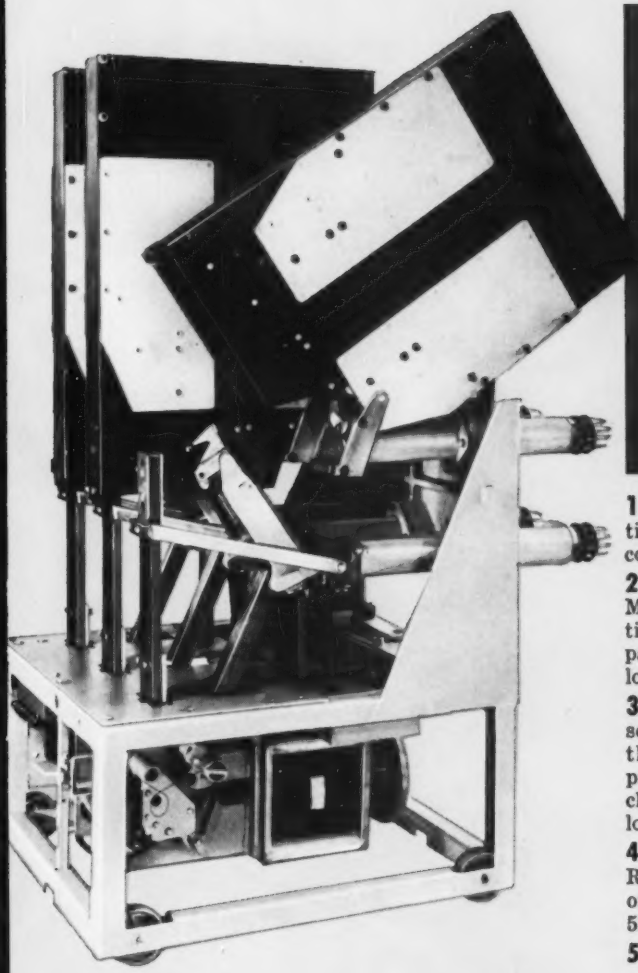

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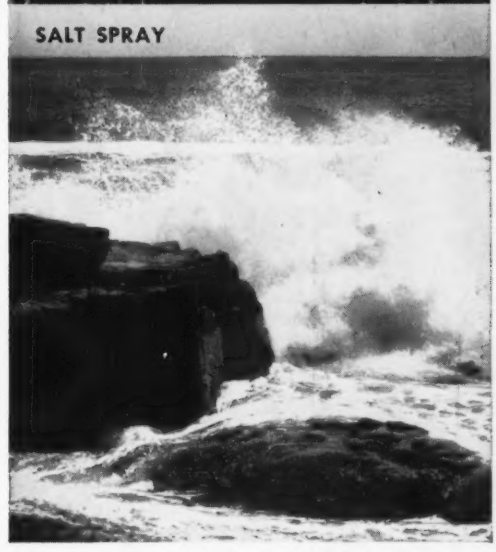

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